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WEEKLY

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VOL. VII NEW YORK, MARCH 18, 1918 No. 1

CONGRATULATORY MESSAGES

Distinct Contribution to Aeronautical Journalism

Mr. Howard E. Coffin, Chairman of the Aircraft Board, writes:

"In reply to your letter of February 18th, asking for my opinion of the place filled by AERIAL AGE during the past year, I feel that, as an interesting record of events in the aeronautical world, attractively presented and so edited as to appeal to the magazine reader who has an interest in flying as well as to the more technical man, AERIAL AGE is a distinct contribution to aeronautical journalism.

"I desire to extend my personal appreciation of the strong support given by your paper to the aviation program."

Splendid and Most Effective Work

Mr. Alan R. Hawley, President of the Aero Club of America, writes:

"I wish to extend to you my most cordial congratulations upon the anniversary of the splendid and most effective work of the publication AERIAL AGE, which completes another year of usefulness for the aeronautic industry. You have covered the ground most completely in all technical matters and have kept thoroughly up to date in all matters of exceptional interest to this fast growing and broadly developing science and art.

"It has given me great pleasure to read the record each week and I have gained great information from its interesting pages.

"Please accept my best wishes for the coming year, which is fraught with such grave responsibilities which are daily being placed upon the shoulders of those responsible for the development of our aerial defenses. Now, more than ever it is necessary for the entire industry to stand together and to carry the military activities of our aerial forces over the lines and to strike at the very heart of the common enemy of the Allies, and there is no doubt that the aeroplane is the most effective weapon to bring complete and irreparable disaster to our enemy and the 'enemy of mankind.'"

Review of the Aeronautic World

Rear Admiral Robert E. Peary telegraphed us as follows:

"Congratulations to AERIAL AGE in commencing its fourth year of constructive patriotic work. To the busy man in Washington, AERIAL AGE comes as a weekly review of the aeronautic world through which he can get the detailed information of events in aeronautical developments and the status of the aeronautic industry. I wish AERIAL AGE additional strength in its fourth year of National usefulness."

Scrupulously Maintained the High Standard

Major B. D. Gray, of the Production Engineering Department of the Signal Corps, writes:

"I have your very good letter of February 18th. In reply I am obliged to confess that my time is so fully occupied with the business of my department that I do not get time to do more than glance hastily through your paper.

"I realize that I am missing a lot of instructive information but I am sure that you are scrupulously maintaining the high standard at which you have always aimed."

Incomparable Foresight

Mr. Henry A. Wise Wood, Vice-President of the Aero Club of America, writes:

"I wish to congratulate AERIAL AGE upon the superb work it has done for our country, and its incomparable foresight.

"It has been fearless in the expression of its patriotism, and unshakeable in pressing upon the authorities its determination that America shall be equipped to master Germany in the air."

Very Valuable

Mr. David L. Gallup, Research and Experimental Engineer of the Nordyke and Marmon Company, writes:

"I am glad of the opportunity of expressing my appreciation of the manner in which information relative to aeroplane work is given out in the AERIAL AGE WEEKLY. The material is not only of great interest to the reader, but is also very valuable. Let me wish you every success in your future work in connection with this paper."

The Mainspring of Literary Aviation

Mr. W. T. Thomas, Vice-President of the Thomas-Morse Aircraft Corporation, pioneer designer, writes:

"The educational work which has been done by AERIAL AGE during the last three years has been of inestimable value to our Aircraft Industry, and it is only through the untiring efforts of some of the early "believers" in Aviation that it has received the consideration from the public, and the Government, which it has.

"There is still a great deal to do along these lines, and we know that AERIAL AGE will be 'on the job.' The future of Aviation is as bright as ever, and I believe the skin has so far just been scratched."

Appreciation

Glenn H. Curtiss, the pioneer inventor, writes:

"I am very glad to take this opportunity to express my appreciation of the work which AERIAL AGE has done in the promotion of aeronautics and in the chronicling of national and international aeronautic activities. I look forward with much pleasure to each issue."

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OUR THIRD ANNIVERSARY

TODAY AERIAL AGE celebrates its third birthday. True it is that we are growing compared with the industry we represent, but we believe that our three years of existence has done much to broaden and elevate the business, and to increase interest in and respect for the aeroplane and the internal combustion engine as an adjunct of modern warfare, and, after the war, as a medium of speeding up commerce and the inter-communication of nations.

AERIAL AGE was established to help pull American Aeronautics through those "Dark Ages" when Congress was allowing only about $100,000 a year for aeronautics. Half of that sum had to be spent in maintenance and it took a whole lot of energetic workers to create public interest to force Congress to give more and to enthuse a few sportsmen to purchase aeroplanes for sport.

It required courage to adopt the name AERIAL AGE. At that time the possible value of aeroplanes for military purposes was still a matter of opinion—and the general opinion was that aeroplanes could not be more than scouts. It was held that aeroplanes could not be used for effective offensive and defensive because the recoil of a gun or the dropping of a bomb large enough to do damage would upset them.

The possibility of large areoplanes equipped with two motors was denied on these grounds: 1, That the thickness of the wings of the aeroplanes must increase in proportion to the span of the wings; 2, That a machine equipped with two motors would spin around out of control as soon as one of the motors stopped.

The very term "factor of safety" was unknown at the time and every machine built was an experiment.

AERIAL AGE was established in March, 1915. Clouds from the war storm which was raging in Europe were beginning to darken America's horizon and energetic work was necessary to awaken this country to the need of aerial preparedness on a large scale.

The United States Army and Navy combined had less than fifty aviators, including those in charge of the administration of the Aviation Section. There were no dirigibles or kite balloons in either the Army or Navy.

The aeronautic industry consisted of a handful of courageous pioneers who had and were doing business at a loss. Congress had only allowed $300,000 for Army aeronautics and $1,000,000 for Navy aeronautics. The Allied countries were ready to give substantial orders, but they would only place orders for prompt deliveries, and as the manufacturers were not in a position to deliver, they would not place the orders.

The editors of AERIAL AGE realized that the war would be decided in the air; and that it was essential for the security of the United States to develop a substantial aeronautic industry, so as to have large sources of supplies of aircraft to meet an emergency. They undertook the huge tack of getting together the factors necessary to create a large industry. That meant the creating of public and official interest in aeronautics in America; making known to the Allies what American manufacturers could do and to make known to American manufacturers and prospective manufacturers the needs of the Allies. It meant more than publishing a good national technical and trade journel well—it meant also the shaping of courses of events in the industry, the directing of purchases and arranging the financing of manufacturers, and fathering the young industry in a general way supplying speakers and moving pictures; supplying "pen pictures" of the status of different aspects of aeronautics to government officials, etc.

To do this AERIAL AGE had to establish four separate departments, one to do the national defense work, one to do the "Service and Advisory" work, one to do the regular work of publishing a national technical and trade journal and one to run a "photo and news service" to supply the aeronautic movement and the press and public with special aeronautic information and educational material.

These four departments have been maintained throughout these years and have rendered invaluable services to Country, to the Aeronautic Industry and to the Aeronautic Movement in general.

With a glance backward, over a year of constructive service, AERIAL AGE looks forward to even greater opportunities for its Fourth Year.

GREAT NATIONAL SUCCESS OF OFFICIAL FRENCH AERIAL WARFARE EXHIBIT ASSURED

Opening of Exhibit in New York International Function

IT has been some time since an art exhibition has opened in New York with so much eclat as attended the first showing of the pictures by Lieut. Henri Farre, representing the "Sky Fighters of France." Gov. and Mrs. Charles S. Whitman were the guests of honor, and the Governor made a speech in praise of the pictures.

Alan R. Hawley, Henry Woodhouse and other members of the Aero Club of America attended, and many American and French aviators and army officers gave a military color to the rooms which were thronged with persons prominent in society, upon whom the pictures of battles in the air made a profound impression.

The pictures are shown in the Anderson Galleries, formerly the home of the Arion Club, a well known German society, and beginning today will be on public view, the proceeds benefiting the children of French aviators killed in the war.

The artist, Lieut. Farre, is himself an aviator, who has been promoted to the rank of observer and bombardier of the first group of the Bombardment Escadrille and has received the Croix de Guerro. He took part in practically all the raids over German cities and munition centres, such as Karlsruhe, Dieuze, and Metz, and has flown over all parts of the battle lines. It is the sights Lieut. Farre has seen from his aeroplane and the air battles in which he participated that he has put on canvas.

Shows Courage In Art

It is startling enough, at first thought, to dream of depicting such events in pictures, but Lieut. Farre is an able, well trained artist—he is a graduate of the Beaux Arts and a frequent exhibitor at the Paris Salon—and the same courage he used in fighting air battles stood him in good stead when painting them.

They are extremely realistic and it was apparent that, in spite of all the photographs and written descriptions that have been published, many of the visitors were realizing for the first time the wonders and horrors and even beauties of the new manner of fighting. The works are astonishing as pictures, but have been painted with such conviction that one ends in accepting them literally. Had one any doubt as to the truth of the pictures the doubt would have been dispelled by the sight of the quick acceptance of the pictures by the many aviators who were present at the reception. The interest in the paintings by Lieut. Farre's fellow flyers was a rather pathetic thing to watch.

Made His Studies In Flight

The artist, of course, did not paint the pictures from an aeroplane. One cannot paint realistically while flying at the rate of 100 miles an hour, but Lieut. Farre devised a method of jotting down color memoranda while in flight and finished the pictures in the calm of a studio.

He touches many phases of air fighting. One sees the machines circling as innocently as birds over mountain masses of cloud, with bits of blurred darker tones where the earth ought to be. One definitely realizes the true direction of the earth in the next pictures of the series, for one of the machines—fortunately a Taube—has been winged and sinks with a trail of smoke straight downward.

The artist strikes a still more dramatic note in the painting that shows the return of the body of Capt. Fequant, pilot, by Sergeant Niox after a reprisal bombardment of Saarbruck. In the fight Capt. Fequant, who was standing up in the machine, was hit by a German bullet and fell partly over the side of the machine. The pilot, with a badly wounded hand, held the dead body where it lay and guided the plane back to the field from which he had started.

The realism of these pictures is of a new sort, and is very different from the realism of Verestchagin, who deeply interested a former generation with his war pictures, but it ought to interest as greatly the general public as it did yesterday the Governor and his staff.

Gov. Whitman in his speech expressed the appreciation of the people of the State for the services rendered by Lieut. Farre, not only as an artist but as a soldier and an aviator. "Some of the men whose faces look down upon us from these walls," said the Governor, "live only in the memory of those who love and honor and cherish the memory of great men and great deeds. Some of these villages portrayed in the pictures exist only on canvas now. They have been obliterated, wiped off the face of the earth, but the men and women from these villages have helped to make the history of which the Anglo-Saxon race, of which the civilized world, is going to be tremendously proud in the years that are to come.

"I am sure that all Americans desire to help the orphan children of the dead aviators who have given their lives for the cause which is just as much our cause as it was their cause."

Among those present were the Duchess de Chaulnes, Marquis and Marquise de Polignac, Mrs. Benjamin Thaw, Mrs. Charles Steele, Mrs. Harry Hamlin, Mr. and Mrs. William H. Crocker, Mr. and Mrs. Edmund L. Baylies, Miss Van Rensselaer, Mr. and Mrs. Jordan L. Mott, Mr. and Mrs. Charles A. Van Rensselaer, Stephen Van Rensselaer, Lieut. Walter Seligman, Mrs. Frederick Lewisohn, Miss Janet Richards, Dr. Frank Northrop, Stephanne Lausanne, Morton Paton, J. F. D. Lanier, Gaston Liebert, the French Consul-General to New York; Mr. and Mrs. Walter E. Maynard, Mr. and Mrs. R. A. C. Smith, Mrs. E. Henry Harriman, Mrs. Charles Dana Gibson, Francis W. Crowninshield, Mrs. Newbold Le Roy Edgar, Mrs. Charles H. Marshall, Karrick Riggs, Miss Pauline Riggs, Miss Frances Ogden, Mrs. John J. McCook, Mr. and Mrs. Walter Rosen, Mr. and Mrs. Goodhue Livingston, Mrs. George Rose, Mrs. W. Astor Chanler, Mr. and Mrs. Leo Everett, Howard Taylor, Mr. and Mrs. Gouverneur M. Carnochan, ex-Ambassador Henry White, George Peabody Wetmore, Mrs. Henry P. Davison, Wadsworth R. Lewis, William W. Miller, Mr. and Mrs. William H. Woodward, Mrs. Stuart Duncan, Mrs. Howard G. Cushing, Mr. and Mrs. F. Gray Griswold, Miss Mary Cass Canfield, Mrs. William D. Sloane, Prince Pierre Troubetskoy and Allison Armour.

There were also present Admiral Fiske, Capt. Noble E. Irwin, Commandant G. Tulasne, Andre Tardieu, French High Commissioner; Lieut.-Col. Charles E. Lee, Lieut.-Col. Ira F. Fuvell, Lieut. Pollock, Sergeant Balsley, Lieut. Flashaire, Brig.-Gen. Kenyon, Pierre Mali, Douglas Wardrop, Alexander McClure, Geoffrey Butler, Jacques Copeau and various members of the company of the Theatre du Columbier, as were also Mr. and Mrs. Lucien Muratore and Mrs. Edward H. Sothern.

The Executive Committee comprised the following personalities:

Mrs. William A. Chanler, Chairman; Commandant G. Tulasne, Mrs. Edmund L. Baylies, Mrs. John Magee, Mrs. Walter E. Maynard, Mr. Frank Crowninshield, Lieutenant Henri Farre, Mr. Alan R. Hawley, Baron Charles Huard, Mr. Henry Woodhouse, Mr. Walter E. Maynard, Treasurer; Mr. Bennett E. Tousley, Secretary.

The National Committee comprises:

Dr. Edwin Alderman, Pres. of University of Virginia; Hon. Robert Bacon, Mrs. William Allen Bartlett, Chairman Aviation Committee, National Special Aid Society; Mr. George Gordon Battle, Hon. James M. Beck, Mr. Edwin Blashfield, Mrs. William H. Bliss, Mr. Louis Boissevain, Mr. Adolphe Borie, Mr. W. H. Brevoort, Mr. I. Tucker Burr, Mr. Walter Camp, Miss Alice Carpenter, Chairman, New York Branch, Woman's Naval Service; Mr. J. Parke Channing, Chairman of the Engineers' Council; Mr. Frederic R. Coudert, Mr. William H. Crocker, Miss Marjorie Curtis, Mrs. Henry P. Davison, Mr. Henry J. Davison, Mr. William Adams Delano, Mr. Edgar B. Davis, Chairman National Defense Committee of the Rubber Association of America; Mr. Morton B. Downs, Duchesse de Chaulnes, Mr. Finley Peter Dunne, Mrs. Newbold LeRoy Edgar, Mr. Charles E. Eliot, Mr. J. B. W. Gardiner, Mrs. Charles Dana Gibson, Mrs. Jay Gould, Mrs. F. Gray Griswold, Mr. John Hays Hammond, Jr., Mrs. E. H. Harriman, Mr. Thomas Hastings, Mr. McDougall Hawkes, Mrs. Ernest Iselin, Mrs. Lewis Iselin, Mrs. Cadwalader Jones, Mrs. Otto H. Kahn, Dr. George F. Kuntz, Mr. Thomas W. Lamont, Mrs. Lewis Cass Ledyard, Hon. G. Liebert, French Consul; Mr. I. Chauncey McKeever, Mr. Eugene Meyer, Jr., Council of National Defense; Hon. Geo. Von L. Meyer, Mr. Edwin G. Merrill, Mr. William Fellowes Morgan, Mr. Chas. A. Munn, Mr. Frank A. Munsey, Mr. Alfonso de Navarre, Prof. Henry Fairfield Osborn, Rear Admiral Robert E. Peary, President, Aerial League of America; Marquis de Polignac, Mr. Augustus Post, Mrs. Ralph Pulitzer, Mr. William Reick, Mrs. Charles Van Rensselaer, Chairman National Aeronautic Committee, Woman's Naval Service; Mrs. Schuyler Van Rensselaer, Mrs. Douglas Robinson, Mr. Charles H. Sabin, Mr. Charles Scribner, Mrs. W. D. Sloane, Mrs. Wilard Straight, Mrs. Herbert Bayard Swope, Mr. Benjamin Thaw, Mrs. William Payne Thompson, Mr. A. Kinnaird Tod, Mr. Bennett E. Tousley, Mr. Charles Hanson Towne, Mrs. Cornelius Vanderbilt, Mrs. Fiske Warren, Mr. Lloyd Warren, Mr. Charles D. Wetmore, Mr. Henry J. Whigham, Hon. Henry White, Hon. Charles S. Whitman, Governor of the State of New York; Mrs. Charles S. Whitman, Mr. Louis Wiley, Mrs. M. Orme Wilson, Mr. Bronson Winthrop, Mrs. Henry A. Wise Wood, Vice-Chairman, National Aeronautic Committee, Woman's Naval Service.

Owing to the general request received the Executive Committee have decided to lengthen the daily exhibit to 10 o'clock in th evening, instead of 5 o'clock as had been decided previously.

First Showing of First Aerial Warfare Films

On Monday, March 11th, the first showing of the remarkable Official French Aerial Warfare films was made. These consist of a series of six films dealing with the making of aeroplanes and motors, the training of aviators, and the different phases of aerial warfare, such as fighting, directing artillery fire, reconnoitering, and aerial coast patrol.

These films were shown daily and attracted large crowds of aeronautic and military authorities and engineers who stated that they were of great value from a military and professional standpoint.

Addresses were delivered by such experts as Lt. Geo. Flashire, the French Ace; Lt. Hunt, Royal Flying Corps; Capt. Berroetta, the French Flying Corps, and Col. Bloomfield, of the Royal Flying Corps.

From New York the exhibit will go to Philadelphia, and then to Washington.

A large number of requests have been received from different cities who are anxious to secure the exhibit and schedule is now being made by the Executive Committee to extend plans to include all the American cities desirous of securing the exhibition in their midst. The officers of the Executive Committee are at 297 Madison Avenue.

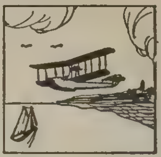
AN INDUSTRIAL DEPARTMENT

WITH its present issue AERIAL AGE inaugurates a new service for its reading clientele, and for the constructive development of the aeronautical industry. During the last year there has been a demand for authoritative information on the part of aircraft manufacturing companies concerning the special opportunities and facilities which industrial centers had to offer them in the matter of factory sites and transportation service. AERIAL AGE'S Service Department is co-operating with the Chamber of Commerce of the important cities in presenting authoritative facts to the aircraft concerns and towards this end commences this week on page 57 a series of articles which will be of immense value to the aircraft manufacturing interests.

The first of the series presents the case for Detroit, by Mr. Allan A. Templeton, the President of the Detroit Board of Commerce; for Philadelphia, by Mr. W. R. D. Hall, Secretary of the Philadelphia Chamber of Commerce, and for Birmingham, Alabama, by Blanks Everett, Secretary of the Birmingham Chamber of Commerce.

The series will be continued hereafter in the first issue of each month.

THE NEWS OF THE WEEK



Aero Club of America Honors Garros

Lieutenant Roland G. Garros, the famous French aviator, who was captured by the Germans but who escaped from a prison camp early in February, was informed by the Aero Club of America that he had been awarded a "unique" medal for the service he rendered aviation by inventing a type of aeroplane on which a machine gun is fired through the propeller.

Reporting an interview, the New York *Times* quotes Garros as follows:

"What are my plans? Of course, I am going back to the front in the chasse escadrille as soon as I have had some training and can get abreast of the new developments. That will take about a month, I expect. You know it is like coming back from the grave. One has to learn over again.

"When I was captured, air fighting was regarded as extraordinary, (Garros omitted to say that he was the pioneer in that branch, and that the first three aerial combats were fought by him.) and my aeroplane had only a ninety horse power rotary motor, with a speed of seventy miles an hour and a 'ceiling' of about 3,000 meters. Now, they tell me, the fighting aeroplanes attack in regular fleets at a speed of over 100 miles an hour.

"I hear that America's air contribution is going to be something remarkable, and many persons seem to be tending to the opinion that the war will finally be won in the air. Personally, I cannot say yet, but I am looking forward eagerly to another go at the Boches. Remember, I have a big score against them to pay for the last three years."

Secretary of War Thanks Mrs. Bartlett

As chairman of the Aviation Committee of the National Special Aid Society, Mrs. William Allen Bartlett has received the following letter from Acting Secretary of War Benedict Crowell, approving of the work of raising money which is being done by the committee through its Treasure and Trinket Fund:

WAR DEPARTMENT,
Office of the Assistant Secretary.
Washington, D. C., March 4, 1918.

Mrs. William Allen Bartlett, Chairman, Aviation Committee, National Special Aid Society, 259 Fifth Avenue, New York, N. Y.

Dear Madam: The War Department is gratified that the Aviation Committee of the National Special Aid Society, through its "Treasure and Trinket Fund," has raised and spent since September, 1917, $30,000, meeting the needs of our aviators.

This useful and patriotic service should be generously helped by our people, and I want to congratulate your committee on the fact that it has been able to supplement what the Government is doing for these men, and to make them feel that the personal good-will and affections of our people follow them in their difficult and dangerous work. Very sincerely yours,

BENEDICT CROWELL,
Acting Secretary of War.

The committee has raised for its aviation work even more than the sum the Acting Secretary mentions in his letter, having made through its fund almost $40,000 since September. It is to begin a big drive which it hopes will draw every old piece of silver and gold from every treasure trove in the country at an early date.

Large Planting to Increase Output of Castor Oil Lubricant

The War Department, through Major-General Squier, Chief Signal Officer, has contracted for the planting of large tracts of land in Texas and other Southern States in castor beans.

It has been found that highly refined oil made from this bean is the only lubricant which permits the air service to get 100 per cent efficiency out of the new Liberty motor.

One of the early problems developed by the powerful Liberty motor was that of finding a lubricant that would keep the bearings in perfect running order for a maximum of thirty hours.

Many tests were made with refined castor oil before it was developed to a point where it did the work satisfactorily.

Air Attack on American Troops in France

A half dozen bombs were dropped behind the American front recently in the sector northwest of Toul by German aeroplanes which were looking for ammunition dumps. They did not succeed in hitting any of their objectives, however, and none of the bombs dropped caused any casualties.

Groups of German bombarding aeroplanes, on the way to cities and towns far behind the lines, are passing over the American front almost continually. They are greeted by a hot anti-aircraft fire from the American batteries.

New York City Department of Education to Train Draft Men in Aero Repair Work

The Board of Education of New York City has started classes in repair work for the aviation service. The work is under the auspices of the Evening Schools, of which Henry E. Jenkins is in charge.

The men will be taught how to reproduce, repair and assemble various parts of the aeroplane. Only drafted men of Class I and 2 and who have had at least one year of experience in a mechanical trade necessary for aircraft work are qualified.

Ten classes to reproduce and repair the wooden parts necessary for an aeroplane have been organized. Two hundred and fifty men are taking this course. Six classes in engine repair work are now in operation, and we have also organized several classes in canvas work.

With the aid of the Eagle Aviation School, the Board of Education has had the use of several large skeleton aeroplanes and the services of Lieut. J. J. Lynch, who for two years served in the war zone with the British Aviation Corps, and of T. W. Gregory, both of whom are attached to the school.

$188,000,000 for Navy Aeronautics

Washington.—In continuing consideration, March 12, of the Naval Appropriation bill, the House Naval Committee increased an item of $94,000,000 for naval aviation to $188,000,000, and provided for an increase in the number of Marine Corps officers.

Group of authorities and officials responsible for the great success of the Official French Aerial Warfare Exhibit in New York. From left to right, top row: Major F. L. V. Hoppin, Military Aid to Governor Whitman; Lieutenant Henry Farré, the famous French painter-artist whose 140 wonderful paintings are part of the Exhibit; Honorable Gaston Siebert, French Counsul General; Governor Charles S. Whitman, of New York; Honorable André Tardieu, French High Commissioner; Commandant George Tulsane, in charge Aeronautic Division of the French Mission; Mrs. John Magee, member, and Mrs. William Astor Chanler, chairman of the Evecutive Committee. Second row: Mr. Alan R. Hawley, President Aero Club of America, member of the Executive Committee; Mrs. Benjamin Thaw, mother of Major William Thaw and Lieutenant Alexander Blair Thaw; Mrs. Walter E. Maynard, member of the Executive Committee; Mrs. Charles S. Whitman; Mrs. Edmund L. Baylies, member of the Executive Committee; Mr. Bernard H. Sandler. Lieutenant George Flachaire. French Air Service; Henry Woodhouse, member of the Executive Committee; Augustus Post, Secretary of the Aerial League of America.

10,000 Skilled Men Needed By the Aviation Section

The Signal Corps has authorized the following statement:

Ten thousand machinists, mechanics, chauffeurs, and other skilled workers are needed at once by the Aviation Section, Signal Corps.

The present call for 10,000 men is to fill an immediate need and may be regarded as the precursor of others as the service is being built up. Even at that the actual strength of the service to-day is over one hundred times what it was on April 1st last year.

The dependence of the Air Service on the most highly skilled men is being brought out more emphatically with every week of development. Where in the first rush there was little experience to indicate this fact, it has since developed that practically 98 men out of every 100 in the service must be skilled in some branch of work.

Aeroplane work has been wholly new and unfamiliar to American mechanics, who have been taken from other trades and converted hastily into workers on the most delicate kinds of jobs. It has been necessary for both officers and men to learn very largely by experience. At the same time a degree of care and attention not usually associated with American quantity, production, and methods has been required, as great watchfulness is essential to prevent any plane leaving the ground in imperfect condition.

Secretary Baker recently expressed this situation as follows:

"The great problem now remaining is to secure the thousands of skilled mechanics, engine men, motor repair men, wood and metal workers needed to keep the planes always in perfect condition. This great engineering and mechanical force at the aerodomes, flying fields, and repair depots, both here and behind the lines in France, is a vital industrial link in the chain of air supremacy. Without them the planes turned out would be useless and the flyers helpless."

Men registered in the draft may be inducted into this service by applying to their local draft board. Men not registered may enlist at any recruiting office. Further information may be had by applying to the air division, Personnel Department, Washington, D. C. In either case they will be sent to San Antonio, Tex., for segregation by trades, followed by a brief course of instruction at the flying fields or at various factories and organized into squadrons mostly for service over-seas.

The present call is especially for machinists, auto mechanics, engine repairmen, gunsmiths, chauffeurs, carpenters, blacksmiths, tinsmiths, cabinetmakers, electricians, coppersmiths, sheet-metal workers, propeller makers, wireless operators and constructors, tailors, tentmakers, sailmakers, truck masters, vulcanizers, welders, and makers, repairers, and installers of magnetos, ignition systems, cameras, watches and clocks, instruments, and typewriters.

No Contest of Liberty Motors

The Aircraft Board issued a denial that a contest between a Liberty aeroplane and an Avro aeroplane is planned. There will, however, be a series of flying tests at Dayton, in order to compare the Liberty and Rolls-Royce engines. Flights are also planned over Washington, but not in the nature of a contest.

Lieut. Francois Brach-Papa, Chief Pilot of the S. I. A. Co., of Turin, who holds notable altitude records.

Gifford to Speed Work on Aeroplanes

W. S. Gifford, Director of the Council of National Defence, has been appointed by the President, director of the Aircraft Board, and will devote much of his time to planning the production which the Aircraft Board will recommend to the Signal Corps.

Aero Squadron Organization in U. S. Army

While the Signal Corps is not giving out the exact organization of the Aero Squadron, the Army and Navy Journal publishes a tentative scheme, which outlines in a general way, the composition and organization of an Aero Squadron.

"The squadron consists of Headquarters, Flying, Supply and Engineer divisions. Its officers are a major, captain and fourteen lieutenants, and an enlisted personnel of approximately 140 men.

"The major is the commanding officer of the squadron, and it is not necessary that he should be a flier. He has an aid in the Headquarters Division, a lieutenant, who is in charge of all paper work, and who, in the absence of the major, takes command. The captain is in immediate command of the Flying Division, consisting of eleven lieutenants. He should be an expert flier and have a thorough knowledge of motors, planes and air currents. He designates the fliers for special duties and is responsible to the major for the planes.

"The Supply Division is in charge of a lieutenant, who must not only look after all supplies for the squadron, but must attend to the transportation. Under the lieutenant in charge of supplies there is a mess officer. The Engineer Division officers must be experts in repair of planes, cars, trucks and cycles. They must keep a report sheet of all men under them, and a memorandum of parts needed to replace stock used. The enlisted force is made up of a sergeant major, a first sergeant, photographer, chauffeur, three corporals, besides dispatch carriers, a motor truck driver and two privates. The supply section has two clerks, a truckmaster, his assistants, a mess sergeant, supply sergeant, mechanic, a corporal, cooks, ten privates (first class and privates) for general work. The enlisted men of the Engineering Section are four master signal electricians, four mechanicians (sergeants, first class) and five sergeants (second class), three corporals and three privates (first class). In the Flying Section of the squadron are one mechanician (sergeant, first class), one mechanician (sergeant, second class) for each two planes, six corporals (one for each two planes), twelve corporals (drivers of motor trucks) and four privates (second class).

"It is probable that there may be one or two more lieutenants than the number mentioned—at least one in the Engineer Division and perhaps two instead of one in the Supply Division. The full number of privates is not given. In addition to the planes there are motor trucks, an automobile for the headquarters, motor cycles, repair trucks, developing room for photographs, apparatus for signalling and other vehicles and devices."

Willard Re-elected Head of Council of National Defence

Re-election of Daniel Willard as chairman of the Advisory Commission of the Council of National Defence was announced recently.

W. S. Gifford and Grosvenor B. Clarkson will continue as director and secretary, respectively, of the commission and of the council.

Four Great Flying Camps Favored By Signal Corps

Division of the United States into four great aviation departments is under consideration by a council of Signal Corps officers, headed by Major General George O. Squier, chief signal officer.

The proposal most favored would result in the formation of an Eastern department to include the Northeastern and Eastern Military departments, with headquarters at Governor's Island; the Southeastern department, covering the territory now embraced in that military department, but with headquarters probably at Atlanta, instead of Charleston; the Southern, with headquarters at San Antonio, and the Central, embracing the Central and Western Military departments, with headquarters at Chicago.

A departmental aviation officer with rank of brigadier general would be placed in charge of each.

The American mission and American pilot pupils at Camp D'Avord. French Official Photo.

Navy Balloonist Has Thrilling Trip

Ablebodied Seaman Bell, U. S. N., of the dirigible balloon section of the Naval Air Squadron, stationed at Far Rockaway, L. I., naval air station, had an unexpected aerial journey a few days ago when he and twenty of his mates attempted to pull a big dirigible balloon to the ground after it had just completed its flight. The wind lifted the balloon into the air and pulled taut the ropes dangling from it. The strain was too much for the other seamen, who released their hold on the ropes, but Bell hung on until it was too late to let go with safety.

He was dragged into the air to a height of more than 500 feet, but he grimly held on to the rope. Before he let go, the big dirigible had raced more than a mile, and then the bag dropped to within a few feet of the ground. Bell jumped into a clump of bushes, receiving only a few bruises.

The navy dirigible was wrecked a few minutes later on the roof of a summer home. The balloon is one of the new patrol dirigibles, over 170 feet in length and a diameter of about 90 feet.

The airship could easily have been brought to the ground without damage by starting up the motors, but owing to the predicament of Seaman Bell the dirigible was permitted to drift, in order to avoid cutting the rope on which Bell was hanging for his life.

"Ballads from Barracks C"

Sergeant Rusti Conn, at present Barracks Sergeant at the Ground School at the University of California, is publishing a volume of aeronautic verse entitled "Ballads from Barracks C." He describes the life of a Flying Cadet and pictures the events that take place at the ground school and the flying field. Sergeant Conn was formerly press agent for Barnum and Bailey.

More Aviation Training Fields

The War Department has authorized the establishment of aviation training camps at Americus, Ga.; West Point, Miss., and Sacramento, Cal. The newly authorized camps will be made what are known as one unit camps, and four squadrons of the Aviation Section will be trained at each of the camps. Several other sites have also been recommended and await the approval of the General Staff and the Secretary of War.

Automobile Output Curbed

One of the first official acts of Bernard M. Baruch, newly appointed head of the War Industries Board, was to issue a request to the motor car industries to cut down their production of pleasure cars fifty per cent., in order to increase the materials and supplies needed for war purposes. Measures are in progress to curtail the use of brick and coal for non-essential purposes.

The policy of the War Industries Board, as outlined by an authority, will be, however, to effect its measures of conservation and priority with the least possible dislocation or shock to industry in general.

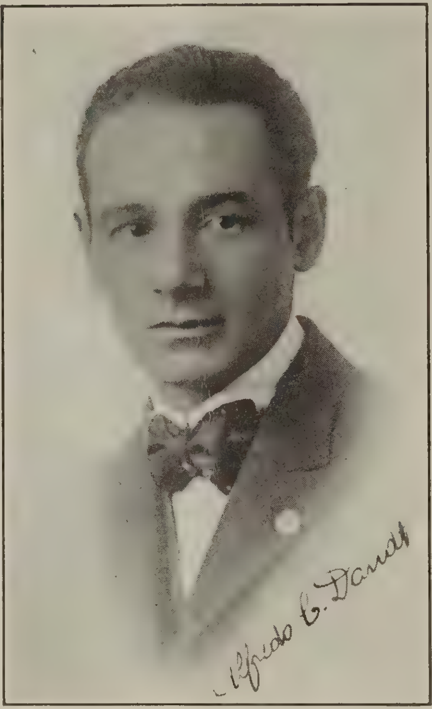
The order affecting the motor car industries is said to be largely actuated by a realization of increasing the output of aeroplane and tank motors.

Lieut. Flachaire to Aid Overseas Hospital

The Mayor's Committee on National Defence of New York City will aid the women's overseas hospital in their grand military and naval meet, to be held on the afternoons and evenings of March 15, 16 and 17th, at Madison Square Garden. In connection with this event, Lieutenant Flachaire of the French Aviation Corps has promised to fly over the city dropping circulars with appeals for the cause. Arrangements are being made to take passengers for flights at $50 per trip.

Aeronautic School at Carnegie Institute

An aeronautic school to be called the Langley Laboratory of Aeronautics will be erected in the near future at the Carnegie Institute of Technogolgy at Pittsburgh. It is expected that the building will be completed in thirty days.



Alfredo C. Dandt, an enthusiastic supporter of aviation in South America.

American Training Schedule Severe

The training schedule now in force at the Signal Corps Aviation Schools required each student to fly nine hours with an instructor before he is allowed to do "solo work." This compares with the four-hour schedule maintained under the regulations of one of the Allies, on whose training system ours has been largely based. The American flying fields to date have had one accident to approximately every 2,400 flight hours against one in every 1,400 in the flying schools of that country.

Rules for Rating of Military Aviators Adopted

Recent regulations of the War Department provide for the rating of reserve military aviators as junior military aviators, and military aviators after a prescribed period of service or for distinguished service upon the recommendation of the commander in charge.

According to these regulations, officers of the Signal Reserve Corps and those temporarily commissioned, who have passed the Reserve Military Aviator test will not be rated as Junior Military Aviators for six months as reserve aviators in the United States, or have served three months as reserve aviators on on active service in time of war, or four months at training stations and two on war duty, unless recommended for distinguished service.

Leaping from Captive Balloon Thrills American Aviator

Six successful leaps from captive balloons are to the credit of an American aeronaut now in London for recuperation after months of active service with the British armies in France. In only one of these perilous and thrilling exploits was the man injured. On this occasion while falling sideways strapped to his parachute, which moved with a stiff wind, his feet caught in the ruins of a shell-wrecked mill, and the muscles of his side were seriously strained before he could get himself loose.

"Tell me about it," said a correspondent for the N. Y. *Globe*. "Are these leaps from balloons thousands of feet up exhilarating?"

The American officer smiled dryly and placed his hand against his injured side.

"They give you some thrill, right enough," said he. "My most pronounced sensation in all my leaps has been that of joy at escaping my Hun assailant or assailants. It is simply immense to find yourself alive and shooting earthward, particularly if toward the rear of your own lines, after machine gun bullets and the flaming balloon have seemed to make your life worth not a second's purchase.

"My latest leap—I hope it may be my last, but probably it won't was into a gale that had been buffeting me for a couple of hours. Indeed, it had made my head ache. It had also slightly numbed my faculties. But for the wind everything was serene. There were some fat clouds about, but no hum of aeroplane. I don't know just how it happened, but before I knew it a Hun airman was pitching straight down at me from the top of a cloud. His machine gun sputtered fiercely as he came. I was not hit, but all at once he got in a fire shell and the balloon burst into flames.

"Then I dipped over the edge of the basket and jumped. Being an old hand at the game I knew how to counteract the effects of the long fall before the parachute opens. I learned this while in those swift dropping New York elevators. At the instant of falling I fill my lungs with all the air I can hold. This fortifies me against the peculiar and powerful upward pressure of the air during the first stone-like fall of some hundreds of feet.

"It was a good job that I dropped fast this time, for that Hun was right after me, shooting as fast as he could. I think I fell 1,000 feet before my parachute took any notice. Then it opened with great suddenness and away I went obliquely through the air at express-train speed. Of course I could not pick a place to land. No man can. When I felt my feet catching in the ragged walls of the building I got out my sheath knife as quickly as possible and cut myself loose. When some of my pals reached me I was quite comfortable. I knew nothing."

Inter-Allied Conference on Standards in London

The Aircraft Board has issued the following statement:

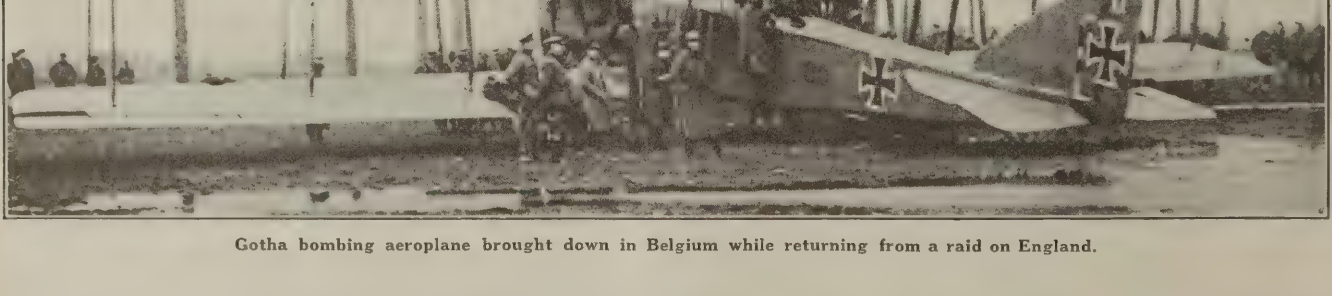
The arrival in England is announced of delegates from all the allied countries for conference on international standards, at which a standardization of manufacturing materials as related to the production of machinery, motors, aircraft, etc., will be considered.

The American delegation, headed by F. G. Diffen for the aircraft board, includes members from all the prominent engineering societies of the country—the Society of Automotive Engineers, the American Society of Mechanical Engineers, the American Society of Testing Materials, etc. There are also members from the Aircraft Board, the Advisory Committee for Aeronautics, the Signal Corps, the Navy, and the original International Aircraft Standards Board, from which this conference is an outgrowth.

The purpose of this inter-allied meeting, which is the result of the efforts of Mr. Diffen, is to enable better industrial service to be given with less man-hour effort, through relieving plants from carrying in stock unstandard materials, for which there is small call, and concentrating on materials of know performance for the same work.

No attempt will be made by the conference to standardize aeroplane construction, but rather those materials and units only which are at present causing confusion in purchase and delivery and for which suitable standards can be established.

The following is the list of the American members: F. G. Diffen (chairman), Dr. W. F. Durand, Lieut. Commander Benjamin Briscoe,



Gotha bombing aeroplane brought down in Belgium while returning from a raid on England.

A Breguet in flight, one of the most efficient fighting machines of the French Air Service. French Official Photo.

Lieut. W. F. Prentice, Coker Clarkson, E. H. Ehrman, Charles M. Manley, James Hartness, Albert L. Colby, F. G. Ericson, Capt. A. B. Tilt, F. R. Baxter.

With the American Air Forces "Over There"

David E. Putnam, a direct descendant of Israel Putnam, has just brought down his third German aeroplane within a month on the French battle front. He is the nineteen-year-old son of Frederick H. Putnam of Boston and Newton. In a letter received by his mother yesterday, he says:

"We had been flying about ten minutes when I looked back and saw two machines headed out of Germany. Down on the nearer one I came, my gun throwing out a spray of lead. But when I had fired about fifty shots he got under me, and I shot by toward plane No. 2, leaving No. 1 for our men behind me. No. 2 dived, but I followed, always shooting. We had come down from 12,000 feet to 3,000 in less time than it takes to tell it, when suddenly the machine in front wavered and then plunged straight down. It was a 'rumpler' biplane. Oh, I am proud!"

Vernon Booth of Chicago, of the Lafayette Corps, brought down a German aeroplane in a fight several miles inside the German line. Booth was on patrol duty when he sighted his adversary, in a two-seated machine, and attacked him at a height of a mile. Several rounds were exchanged, and soon the German began to descend. Booth followed the hostile aeroplane down until it fell into a forest just inside the German lines.

A N. Y. "Times" correspondent writes that American army aviators in France are doing good work, using ten French Briguet machines in daily flights over the German lines. Several combats took place in the course of a week, one enemy machine being brought down in a wood near a field hospital. Four Zeppelins passed on one day recently, going toward the Swiss frontier. Our officers at the aviation camp believe that the army should adopt the three best types of allied machines and improve upon them.

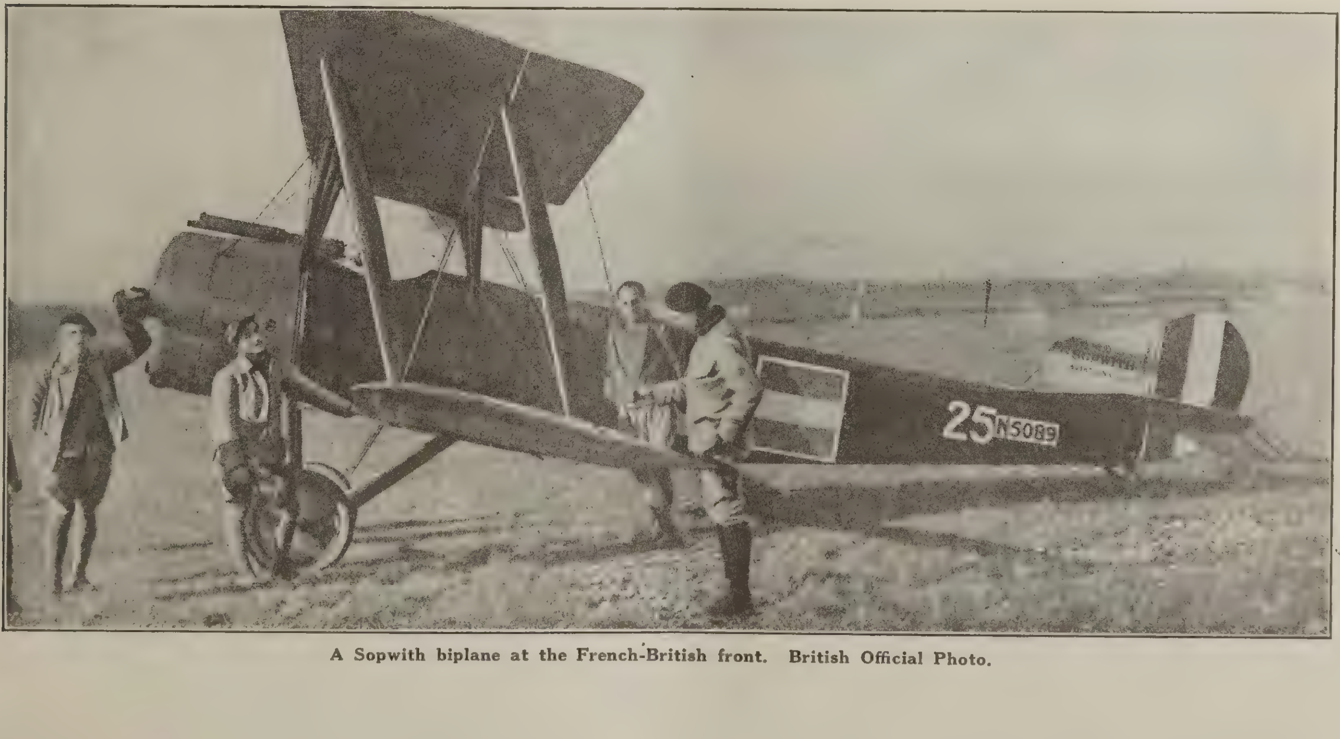
A "Globe" correspondent in Paris describes the office of the American Air Service in a recent despatch to his newspaper. A modern seven story apartment house has been requisitioned for this purpose.

There are about 1,000 persons working in this building, through which much of the business of the air service passes, although it is not the air service staff headquarters. All are on duty from 9 A. M. until 12.30 P. M., off for an hour or an hour and a half at the most for the midday meal, after which work goes on steadily until 6 P. M.

On each floor is a French soldier to direct visitors who do not speak English. In each apartment is a separate section of the service —instruction, material and others, from the first floor to the sixth.

Vernon Booth, of the Lafayette Flying Corps, brought down his first Boche machine. Booth was a very popular member of the Harvard Club of New York, where he has resided since 1913, up to his departure for France, practising law.

Cadet Joseph F. Stillman, a Yale graduate, was killed in a collision while training in England. Stillman won distinction as a football player and in rowing.



A Sopwith biplane at the French-British front. British Official Photo.

An interesting trophy of the British Western front—the fuselage of a German chaser. British Official Photo.

Curtis Seam Read, also of Yale, one of the first to volunteer in the Yale Hydro-Aeroplane Unit, was the victim of a hydro-aeroplane accident in France. Read was one of the most popular members of his class.

Personal Paragraphs

N. J. Clausen has joined the Curtiss Engineering Corporation, Garden City, N. Y. He formerly was a draftsman with the Otis Elevator Co.

M. L. Heminway, formerly sales manager of the Davidson Rubber Co. of Boston, has been appointed secretary of the War Service Committee of the Rubber Industry of the U. S. A.

Harry Newman, a motor car distributor of Chicago, has arranged to sell aircraft as well as road craft. He is the first motor car dealer to handle aircraft on a commercial basis.

Donald W. Douglas, formerly aeronautical engineer, Aviation Section, Signal Corps, Washington, is now chief engineer, Glenn L. Martin Co., Cleveland.

John J. Rooney, formerly at New York, is now aeronautic engineer, Briggs Aeroplane Co., Alexandria, Va.

Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, is one of the directors of the new Y. M. C. A. School of Aeroplane Construction which has recently been started at 717 North Broad Street, Philadelphia. The purpose of this school is to assist in the aircraft production program by developing skilled labor that can be utilized in factories throughout the country.

The engagement of Miss Dorothy Van Winkle to Harry V. Moser, a cadet at Love Field, Dallas, Texas, was announced recently. Moser graduated from the School of Military Aeronautics at Princeton.

Experts Design New Air Bullet

Washington.—The War Department has made public the announcement that the ordnance bureau has developed bullets of three types for use of aeroplane fighters which equal in qualities anything which our allies or the Germans have produced.

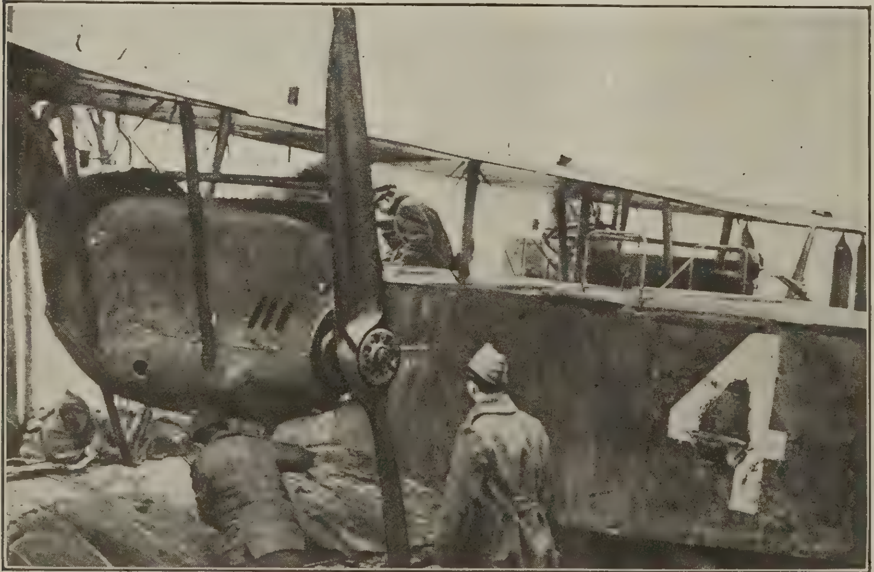
"The present war brought forth a new kind of ammunition for aeroplane use in the form of special cartridges containing bullets for armor piercing, tracing and incendiary purposes," said the statement.

"With the progress the more military parts of the aeroplane were protected with light armor, so that it became necessary to introduce the armor piercing bullet.

"As the gasoline tanks were particularly susceptible to incendiary explosion. It was necessary to procure a bullet containing an inflammable substance, ignited upon discharge, which would carry the spark or flame into the tank upon piercing it.

'As the target (the enemy aeroplane) was within fighting range for only brief moments at a time and as there were no means of determining the fire effect as on land, a tracer bullet containing a bright burning composition which would indicate the path of the bullet in daylight as well as darkness, and thereby allow the aim of the machine gun to be corrected, was introduced. The composition is set on fire upon discharge and the bullet flies through the air as a bright spark, plainly visible to the machine gun operator."

In addition to the three distinct types of bullets the ordnance experts have developed combinations of the ignition of the tracer bullets with the armor piercing heads which are regarded as remarkable accomplishments in view of the fact that the diameter of these projectiles is only 3-10 of an inch.



The engine housing on the German Gotha brought down recently in Belgium. French Official Photo.

Cotton Approved for 'Plane Wings

Washington.—Official denial that the government has been placing orders for silk for use in the manufacture of aeroplane wings has been issued by the Aircraft Production Board. Rumors that heavy purchases of silk were contemplated have been circulated and many offers have come to the purchasing department from manufacturers whose material was said to be satisfactory for aeroplane purposes.

It is true, however, that silk has been considered. In fact, all fabrics have been experimented with, and the Bureau of Standards has been working under the supervision of the Aircraft Production Board, endeavoring to find the best material for wings. In addition, many experiments are being made by private individuals and manufacturers.

Before the war linen was used exclusively for aeroplane wings, but since the conflict broke out the availability of flax has been materially lessened and it was necessary to find a substitute. England, France and Italy used all the linen produced within their borders, and it was placed under an embargo early in the war.

The enemy countries had the advantage of obtaining flax produced in conquered Belgium. The linen that could be spared by the allies was not nearly enough to keep up with the ambitious air programme of the United States.

Linen wings were treated with acetone "dope," to make the fabric taut, non-inflammable and strong, and also to keep it from splitting and tearing when the wings were riddled with shrapnel. Silk, it was found, would not take this "dope," and the same is true of many other fabrics. The most severe tests were imposed on all fabrics, it being necessary to subject them to conditions stimulating as nearly as possible actual war conditions —twisting, turning and explosive and incendiary bullets.

Out of all the fabrics placed under these tests cotton proved to be the most satisfactory. A new way of spinning this material was devised and this method is closely guarded as a valuable military secret. Roughly compared with the usual process of cloth production, its description is covered by the term "spinning backward."

This new process cotton is said to surpass the stoutest linen and has passed the most rigid tests. Early experimenters thought it had an admixture of linen, but when unraveled it was found to be "pure cotton." It is understood the fabric has worked out so satisfactorily that the British Government has ordered several million yards for aeroplane purposes. It has also been found to be desirable for tentage.

New Type of Coupling Overcomes Rattle and Back Lash

A newly designed coupling, adaptable to all magnetos, generator or pump shaft drives, is similar in construction to the Oldham type, excepting that it has an automatic spring take-up for wear and to prevent noise.

The center piece consists of a ring two inches with $\frac{3}{32}$" wall and riveted solidly to the inside of this ring are two triangular shaped steel blocks; (these rivets however do not carry any load).

Placed midway between these two solid blocks are two similarly shaped blocks loosely riveted and are impelled inwardly by means of small coil springs. Regularly constructed shaft end members, each with two projections or jaws opposite each other, are inserted between the blocks, thus forcing the loose blocks outwardly from their inner rivet heads by deflecting the springs.

Due to spring pressure these loose blocks hug the jaws at all times and will take up any wear that takes place. This squeezing action of the loose blocks does away of course with all looseness, rattle and back lash. The drive is meant to be taken on the solid blocks, but the spring tension is such that the loose blocks withstand a pressure of 34 pounds before they will squeeze outwardly.

About twenty-five of the largest motor car, truck and motor manufacturers have been testing this coupling, which is manufactured by G. D. Bailey Co. of Chicago, for several months with satisfactory results in every case and several good sized contracts have already been made and many more will be closed in the next few months. Allowance is made for $\frac{1}{32}$" wear, but many tests covering from 25,000 to 30,000 miles have shown a wear of less than .005.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
EHT—Report to Ellington Field, Houston, Tex.
ELA—Report to Eberts Field, Loanoke, Ark.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from active duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
THT—Report to Taliafero Field, Hicks, Tex. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDO—Report to Wilbur Wright Field, Dayton, Ohio.

Note 1. Report to Signal Corps Camp, Dallas, Tex.

Note 2. Report to district manager of inspection, 870 Woodward Ave., Detroit, Mich.

Note 3. Report to Pawtucket, R. I.

Note 4. Report to commanding officer, 309th Cavalry, N. A., Fort Sam Houston, Tex.

Note 5. Report to New Haven, Conn.

Note 6. Report to Chicago, Ill.

Note 7. Report to School for Radio Mechanics, Carnegie Institute of Technology, Pittsburgh, Pa.

Note 8. Report to headquarters, Southern Department, as aeronautical officer of that department.

Note 9. Report to commanding officer, training section, air division, Washington, D. C.

Note 10. Report in person to the Secretary of War.

Note 11. Report to Signal Corps Troops, Arcadia, Fla.

Note 12. Report to Major C. M. Hall, equipment division, Dayton, O.

Note 13. Report to Riverbank Laboratory, Geneva, Ill.

Note 14. Report at Dayton, Ohio.

Note 15. Report with detachment of seven enlisted men of 501st Aero Construction Squadron.

Note 16. Report at Camp Dick, Dallas, Texas.

Note 17. Report to Chief of Staff.

Note 18. Report to District Inspection Manager, 870 Woodward Ave., Detroit, Mich.

Note 19. Take station at Rochester, N. Y.

Report 20. Report at Army and Navy General Hospital, Hot Springs, Arkansas, for treatment.

Note 21. Report to Lieut. Col. Virginius E. Clark.

Note 22. Take station at New York City.

Note 23. Report to Aviation Mechanics' Training School.

Note 24. Report to Maj. H. L. Shepler, plane production section, Cleveland, Ohio.

Note 25. Report to District Manager of Inspection at Pittsburgh, Pa.

Special Orders 46 to 49 Inclusive

A

Anderson, Frank A.	SLR
Andrew, Flynn L. A.	SLR; AGC
Ahlgren, Arthur R.	SLR
Andrews, Frederick B.	SLR
Ashwell, George B.	SLR
Austin, Charles H.	CPR
Aimo, Frank L.	SLR
Alvey, Paul	SLR
Arthur, Dogan H.	SLR
Ayres, Malcolm B.	RWT
Adams, John F.	FLR (Note 1)
Andrews, Frederick B.	SLR (Note 9)
Augur, Murray Blachley	SLR; SBI
Angstrom, Lawrence C.	FRF
Austin, Fred	SLR
Akers, J. R. Homer	SLR; HHN
Angell, Cyril M.	SLR
Abbott, Melvin Johnson	CPR; CSO
Abernethy, Thomas J.	SLR
Atchinson, Thomas C.	SLR
Abrams, Peter	SLR

B

Bradley, Eric T.	CPR
Brown, Lowell H.	CPR
Bauerfind, Lanus E.	SLT
Brown, Wendall W.	SLR
Brown, William L.	CPR
Brown, Raymond J.	SLR
Betterly, Warren A.	SLR
Benham, John A.	SLR
Bradford, Harry A.	SLR
Benson, Robert H.	SLR
Bond, George C.	SLR
Belford, Fred H.	SLR
Benet, William R.	SLR
Blackman, Berkeley	SLR
Baker, Earl R.	SLR
Bornfield, Harold T.	SLR
Bowen, Charles C.	SLR
Bowman, Samuel O.	SLR
Bennett, John J., Jr.	SLT
Bennett, Samuel C., Jr.	SLR
Bowen, Orloff L.	SLR; AGC
Bradley, Eric T.	MAJ
Bevan, William A.	FLR
Brinsmade, James B.	FLR
Boedker, William F.	FLR
Bloom, Robert E.	SLR; GIT
Burke, Hubert J.	SLR
Beem, Cash C.	FLR
Bellew, Paul G.	FLR (Note 1)
Baird, Harold C.	SLR
Barr, Eugene O.	SLR
Bardwell, Darwin E.	SLR
Baxter, George R.	SLR
Bowles, Walter S.	SLR
Buckley, John H.	SLR
Burns, Thomas R.	SLR
Bird, Byron	SLR
Brockway, William N.	SLR
Bowser, Henry R.	FLR
Brooks, John P.	FLR
Burdick, Paul Howard	SLR; WCS (Note 13)
Baez, Raphael, Jr.	SLR
Baskey, Earl F.	SLR
Billups, Val T.	SLR
Boyd, Beverly M.	SLR
Barkelew, Peter V. O.	RWT
Barkalew, Samuel W.	RWT
Barron, John J.	RWT
Burge, Edwin	SLR
Bergman, Helmer W.	RWT
Berry, William P.	FLR (Note 1)
Baskin, Thomas H.	FRF
Betz, Charles F.	CPR
Boyle, Robert Driscoll	SLR; LDT
Burky, Raymond C.	FRF
Babcock, Edward D.	SLR; CUI
Barlow, Stephen Morris	CAP: CAF
Betterly, Warren Albert	SLR; SBI
Bonham, John A.	SLR; SBI
Bradford Harry Alonzo	SLR; SBI
Babcock, Howard O.	SLR
Benson, Albert T.	SLR
Biddle, Craig	SLR
Bucklin, Paul D.	SLR
Bunnell, Miron	SLR
Butler, Joseph F.	SLR
Blood, Frank LeRoy	SLR
Bijur, Harry	SLR
Buckley, Charles J.	SLR
Bowen, William Spencer	SLR; FOB
Brown, Raymond James	SLR; MIT
Bigelow, Jr., Joseph S.	SLR
Bodenheimer, Betram	SLR

Senator Harry B. New, of Indiana, about to climb into the Avro machine in which he flew over the Capital, piloted by Col. C. L. Lee

Bollman, Henry	SLR
Burrall, Hallett Jenkins	SLR; LDT
Burke, Hubert Joseph	SLR; EHT
Brooks, J. Ansel	CPR; GLC
Bitzer, Robert H.	SLR
Bower, Paul E.	SLR
Bronson, Tyler C.	SLR
Brotherton, William E.	SLR
Bryan, Mahlon P.	SLR
Bush, Roland A.	SLR
Bailey, Joe R.	REL; RTR
Benford, Alfred C.	REL; RTR
Bryant, Frank Archiple	FLR; CSO
Bancker, William Dudley, Jr	SLR; EHT
Buck, Edward Hastings	SLR; EHT
Brown, Ammi	DIS
Braid, William Grinnel	SLR; THT
Blakeley, George Washington	SLR; EHT
Braun, Arnold William	SLR; EHT
Bocker, Leon M.	SLR
Brooke, Boone W.	SLR
Buttrick, Alden C.	SLR
Blee, Harry Harmon	Note 21; MDO
Bovard, Warren B.	Note 17

C

Coffman, Don M.	FLR
Curry, Howard S.	CPR
Curley, Martin L., Jr.	FLR; GIT
Cowgill, John R.	FLR
Charitree, Andrew J.	SLR
Canute, Olin J.	FLR
Cheney, Archibald E.	SLR; GIT
Cruikshank, Colin J.	SLR
Carney, Thomas C.	SLR
Coleman, Russell L.	SLR
Collins, Albert J.	SLR
Colver, Henry A.	SLR
Cort, Arthur J.	SLR
Culbertson, Joe L.	SLR
Cleveland, Robert L.	SLR
Crawford, Daniel McL.	SLR
Campfield, Hugh C.	SLR
Cowan, John C.	FLR
Crews, William W.	SLR; AGC
Camp, Julian L.	SLR
Cary, Edward A.	SLR
Chapin, Charles G.	SLR
Clark, Kenneth L.	SLR
Collins, Paul F.	SLR
Cook, Charles I., Jr.	SLR
Coney, William D.	SLR
Clark, Harold L.	SLR
Colt, Charles	FLR
Coble, Paul L.	RWT
Calef, Robert C.	SLR
Cannon, Lawrence H.	SLR
Cottrell, Arthur M.	RWT
Coffman, Dan Moser	FLR (Note 12)
Cutler, Harold S.	FLR (Note 1)

Cadet Thomas L. Miki, training at the University of Illinois for air service. He is an American from Hawaii, of Japanese parentage

Coleman, Loring W.	SLR
Croxford, Frank D.	SLR
Collins, Albert James	SLR; MIT
Cort, Arthur Jefferson	SLR: MIT
Cowan, John Christopher	FLR; SGS
Coleman Russell Lowell	SLR; SBI
Colver, Henry Andrews	SLR; SBI
Clark, Charles L.	FRF
Carney, Thomas C.	SLR; THT
Cook, Charles C.	FLR
Copsey, Robert L.	FRF
Connell, Samuel M.	SLR
Cunliffe, Jr., William H.	SLR
Clyde, Robert M.	SLR
Cruickshank, Colin Joy	SLR; EHT
Crawford, William J.	SLR
Chamberlain, Rowland L.	SLR
Charnley, William S.	SLR
Clark, Ralph N.	SLR
Coker, John J.	SLR
Christopher, Luke	SLR; THT
Case, Lyman E.	FRF
Cabot, James Jackson	SLR; THT
Clarkson, Jr., Robert Cook	SLR; BST
Cogan, William J.	SLR
Cowan, Royal W. B.	SLR
Cunnius, Percy E.	SLR
Christopher, Gerald A.	FLR; CSO
Cassel, Jr., James C.	REL; RTR
Cone, Clarence Nelson	SLR; EHT
Crowell, Elmer A.	SLR; LDT
Culbertson, Joe L.	SLR; HHN
Cameron, Allan J.	SLR

D

Darnell, Rezneat M.	SLR
Dawson, Fred C.	SLR; AGC
De Niff, John F.	RWT
Dorflinger, Lambert	RWT
Dick-Peddie, William S.	SLR
Daly, Edward J.	SLR
De Montel, Elmer C.	SLR
Dahl, George L.	SLR
Denis, John F.	FLR
Durrett, William B.	FLR
Donalds, John E.	SLR
Durand, Elliot, Jr	SLR; AGC
Davis, John E.	SLR
Dunlap, John R., Jr	SLR
Duffy, Felix H.	FLR (Note 1)
Dawson, Charles S.	(Note 7)
Davenport, Carlton P.	FLR (Note 1)
Doyle, Edward T.	FLR (Note 1)
Deering, William F.	FLR
De Shields, Charles B.	SLR
Darling, Harold Preston	SLR; PFO
Duke, Donald George	SLR; PFO
Donalds, John Eustace	SLR; EHT
Dorland, Carl C.	SLR
Davis, Milton F.	MAJ; CSO
Dusher, William R.	UTA
Dalton, Wilfred	SLR
Derge, David R.	SLR
Dahl, George L.	SLR; HHN
Darr, Harold S.	FRF
Dawson, Joseph M.	FRF
Denny, Jr., Harmar D.	SLR
DeFrance, Smith J.	SLR
Donohe, John F.	SLR
Doggett, William K.	UTA
Dimmick, Harold E.	SLR
Drury, Alden Monteith	SLR; EHT
Dennie, Norvell D.	SLR
Donaldson, John S.	SLR
Davis, John W.	REL: RTR

E

Eastman, Eugene	SLR; AGC
Everson, Charles W.	FLR
Evans, Earl F.	SLR
Evans, Griffith C.	CPR
Ellis, Sam L.	SLR
Ernst, Norman C.	SLR
Eden, John H., Jr.	SLR
Elliot, Frank T.	SLR
Enlow, Charles E.	SLR
Epp, Otto C.	SLR
Eyre, Edward E.	SLR
Eylers, John D.	FLR (Note 1)
Eubank, Eugene L.	SLR
Elliot, John S.	FLR (Note 1)
Ewing, Maskell, Jr.	FLR
Epp, Otto Carl	SLR; EHT
Ellis, John DeM.	SLR
Ehrenberg, Conrad E.	FRF
Estes, William B.	REL; RTR
Edson, Carroll A.	REV
Estill, Frank S.	FLR
Epperson, Arthur Roy	SLR; EHT

F

Ferguson, James E.	REL
Fisher, Robert B.	SLR; GIT
Foote, Charles L.	SLR
Fillot, Alexander M.	RWT
Fitssimons, Richard A.	SLR
Franklin, Elbert W.	SLR
Fanning, Winthrop C.	SLR
Fairman, Earl T.	SLR; AGC
Farmer, Marion A.	SLR; AGC
Funger, Robert A., Jr.	SLR
Franklin, Luther G.	LMA (Note 15)
Floyd, Robert K.	SLR
Farnam, Julian P.	SLR
Fellows, Eugene R.	RWT
Feinstein, Harman	SLR
Fernald, Reginald G.	SLR
Flaherty, John J., Jr.	SLR
Francis, Olin C.	FRF
Ferguson, Philip M.	FRF

Feasel, Fred	FRF
Fitzgerald, Gordon Pendelton	SLR; LDT
Fisher, Edgar C	DIS
Farnsworth, William O	FLR
Fox, Edwin D	SLR
Freeman, Maurice J	SLR
Fisk, James K	FLR
Flachsenhar, Walter R	SLR
Forshey, Fred W	SLR
Fitzkee, Adam H	SLR
Frobisher, Joseph E	SLR
Frankenberg, Edward S	SLR
Frost, Edward P	SLR
Fonseca, Francis Mitchell	SLR; EHT
FitzSimmons, Jr., William H	UTA
Fredell, Edwin Joseph	FLR; CSO

G

Grantz, Raymond L	SLR
Gallagher, William F	SLR; AGC
Giles, Benjamin F	SLR; AGC
Gildersleeve, Samuel B	SLR; GIT
Graham, William Richard	FLR; SGS
Glaser, Albert Jacob	SLR; SGS
Goodrich, Joseph Edwards	FLR; SGS
Greene, William J	FLR (Note 1)
Geisendorf, Louis C	FLR
Gell, Harry	SLR
Glaser, Albert J	SLR
Gale, Harold DeF	SLR
Golwicks, Myles W	SLR
Green, Alfred M	SLR
Griswold, Clifford B	CPR
Gillett, John D	SLR
Gillson, George B	SLR
Gillette, Harold L	RWT
Granger, Hermon H	SLR
Geehan, James A	FLR (Note 1)
Gatch, Nelson B	FLR
Gianniny, Lawrence G	SLR
Goodyear, Robert F	FRF
Guyer, Leigh Davis	AAD; CSO
Gamble, Thomas S	SLR
Gauntlett, John McG	SLR
Grossman, Herrick J	SLR
Gilchrist, John W. S	AAD; AGC
Gape, Leo B	SLR
Grant, Sidney Bradford	SLR; EHT
Grayson, Lawrence A	SLR
Galligher, Harry P	SLR; PFO
Garver, John Baltzly	SLR; THT

H

Harman, Harold G	SLR; GIT
Hayes, Roy Webster	FLR; SGS
Hughes, Charles F	RWT
Hanley, Thomas J	FLR (Note 1)
Henley, Harold R	FLR (Note 1)
Heilman, Warren B	FLR (Note 1)
Hubner, George H	FLR (Note 1)
Hurst, Edward	FLR (Note 1)
Henshaw, Griffith	SLR
Hatch, Horace McK	SLR
Henderson, Tom S., Jr	SLR
Hammond, Lowell W	FLR (Note 1)
Hawkridge, Leslie D	SLR
Holbrooke, Albert I	SLR
Hager, John M	SLR
Hoyt, John R	SLR
Hyde, William A	SLR
Holmes, Samuel S	SLR; AGC
Head, Guy V	CPR
Hoopes, Eugene S	CPR
Hanson, Harry L	SLR
Hawley, Frank M	FLR
Hendrick, Sypret W	FLR
Hamilton, Stewart A	SLR
Hayes, Roy W	FLR
Hanel, William, Jr	RWT
Hennessey, Harold P	SLR; GIT
Hawley, Alfred DeW	SLR
Huner, Franklin K	SLR
Henry, Rufus F	SLR
Hayes, Frank L	UTA
Hall, Lysle G	SLR
Hopkins, Lionel P	SLR
Hauer Edward C	UTA
Hartney, H. E	FRF
Hager, John Manfred	SLR; HHN
Hoyt, John Robertson	SLR; HHN
Hyde, William Albert	SLR; HHN
Hamer, Edward B	FRF
Hegge, Adolph	PUP
Hardy, Arthur A	UTA
Hansen, Harry Leonard	SLR; EHT
Hall, Kent B	SLR
Halliday, Morris S	SLR
Haskell, Spencer H	SLR
Higbie, Harley G	SLR
Hightower, George B	SLR
Hinckley, Frederic G	SLR
Hendrick, Sypret Warfield	FLR; LHV
Hait, Roswell N	SLR
Holland, Maurice	SLR
Heath, Hamlin R	FRF
Hall, John Washington	SLR; GLC
Hill, Jr., Armistead Burt	SLR; EHT
Hamilton, Ferris F	SLR
Harrold, Henry W	SLR
Heller, Myron	SLR
Horne, Jr., George Willard	SLR; EHT
Hahn, Emanuel	FRF
Hagenbuch, Rea I	SLR
Hogan, John R	SLR
Huebner, Herbert C	SLR
Herrick, Gerardus P	CPR
Hawkridge, Leslie Dean	SLR! WCS; Note 22
Hawley, Frank Myron	FLR; Note 25
Hoagland, George B	Note 23

Col. John Nance, the Chief of the Balloon Division of the U. S. Air Service. A balloon unit was the first American aerial contribution to the Allied forces on the Western front

I

Imes, Terrance William	SLR; THT
Isreal, Gerald H	SLR

J

Jackson, Samuel E	CPR; WCS (Note 3)
Johnston, James A., Jr	SLR
Jones, William M	SLR
Jones, Parke Poindexter	SLR; GLC
Jacobson, Lester	RWT
Jacob, William C	SLR
Johnson, Elmo G	SLR
James, Edwin D	SLR
Jewell, Sidney L	SLR
Johnson, George P	SLR; AGC
Johnston, Jr., James Archibald	SLR; HHN
Johnson, Charles C	FRF
Jordon, Daniel	FLR
Jefferson, Theodore	SLR; LDT
Jagoe, Walker M	SLR
Jones, Arthur H	SLR
Jackson, Clyde Henry	SLR; Note 16

K

Kirby, Kent S	SLR
Kopff, Frederick L	FLR (Note 1)
Kelley, Arthur T	RWT
Kelley, James M., Jr	SLR; AGC
Kelly, Shorwin F	SLR
Kennedy, Chester H	SLR; AGC
Kennedy, Thomas E	SLR
Kondall, John D	SLR
Kingsley, Wilburt E	SLR
Koepfgen, Leslie P	SLR
Kittredge, Albert R	SLR
Kane, Clarence P	SLR
Kent, Warner W	SLR
Kluback, Samuel R	SLR
Kugler, Martin B	SLR
Kearney, Albert B	SLR
Koehn, Max	SLR
Kessler, Samuel R., Jr	SLR; AGC
Keys, John F	SLR; AGC
Kingsbury, Joseph J	CPR
Keffer, Jr., Karl	SLR; PFO
King, W. W	FRF
Kearney, Albert Bradley	SLR; SMM
Koehn, Max	SLR; SMM
Killough, Hugh Baxter	SLR; PFO
Keene, Charles W	FRF
Janda, George Walter	FLR; CSO
Kelly,, Carl Duncan	FLR; CSO
King, Ivan R	SLR
Kadel, George J	FLR
Kimber, George H	SLR
Kemp, Wallace L	SLR
Kohfeldt, Fred C	SLR
Kuntz, Frank Edward	SLR; LDT
King, George Edward	FLR; ADO
Kenyon, Douglas H	SLR
Krout, Ray W	SLR

Officers of an R. F. C. bombing squadron fix the connections to their glove heating apparatus, before a night bombardment

Kent, Richard A.....SLR
Kistler, Bruce.....SLR
Keough, Wesley Lincoln.....SLR; KST
King, Olen.....SLR; KST
Kenyon, Johnson Darby.....SLR; THT
Kaufmann, Godfrey Frense.....SLR; KST
Kisselberg, Bert M.....REL; RTR

L

Long, John J.....FLR
Lee, John F., Jr.....SLR
Longstreth, Walter W.....SLR
Lewis, James C.....SLR
L'Ehmann, Chester L.....SLR
Lawrence, George W.....SLR
Lannen, Leo V.....FLR
Lesher, Lea R.....FLR
Lilley, John L.....FLR
Laughlin, Douglas E. S.....RWT
Le Royer, Charles P.....SLR
Ledbetter, Eugene P.....SLR
Lake, Chester H.....SLR
La Vie, George A., Jr.....SLR
Lehmann, Henry P.....SLR
Lilly, Roy M.....SLR
Lewis, Alexander B.....RWT
Lord, Devereaux.....FLR (Note 1)
Luscher, Carter.....SLR
Lentz, William.....RWT
Lyman, Ronald T.....MJR
Lemkin, William L.....SLR
Law, Hugo B.....SLR
Lee, Zanna P.....SLR
Ledlia, Robert H.....SLR
Lyon, Alfred J.....SLR
Lindgrove, Martin S.....FLR (Note 1)
Leath, Gil J.....SLR
Lindorff, Theodore J.....SLR
Lanfall, John T.....SLR
Lasell, John W.....SLR
Lewis, Tracy H.....SLR
Long, Monroe H.....SLR
Look, Clarence A.....SLR
Livingston, Louis.....UTA
Lannen, Leo Vincent.....FLR; CMV
Lycan, William J. B.....FRF
Ledlie, Robert Herschel.....SLR; SGS
Le Royer, Charles Philip.....SLR; KST
Lanfall, John Tollesfon.....SLR; GLC
Lersch, Joseph F.....SLR
Lewis, Floyd C.....SLR
Lyon, Alfred Jefferson.....SLR; EHT
Leonard, Edgar W.....SLR
Leopold, Joseph.....SLR
Lasell, John Whitin.....SLR; LDT
Loud, Harold E.....SLR
Long, John Joseph.....FLR; CSO
Lilley, John Leavens.....FLR; CSO
Law, Hugo B.....SLR; EHT
Lyman, Ronald T.....MJR; CSO
Lee, Zanna Park.....SLR; EHT
Latham, Sylvester A.....SLR
Lawrence, Edgar.....SLR
Lovenberg, Frederick H.....SLR
Lamkin, William Lester.....SLR; KST

M

Moore, Lucien W.....SLR
Mitchell, Walter L.....CPR
Murphy, James M.....FLT
Mayhew, Harry E.....FLT
McCarthy, Emmett J.....SLR
Melick, Paul K.....SLR
Moffat, Reuben C.....SLR
Morrissy, James E.....SLR
Makielski, Stanley J.....SLR
Moore, Edward S.....MJR
MacBey, Sidney J.....SLR
Meeks, Charles C.....SLR
McAdow, Lewis H.....CPR
Magee, John A.....RWT
Maxwell, Allen G.....RWT
McLaughlin, Edward J.....RWT
Merriam, Charles E.....(note 10)
Mack, Allen F.....SLR; AGC
Martin, Linville K.....SLR; AGC
Meredith, George W.....SLR; AGC
Mulvihill, William H.....SLR
Minor, George C.....(Note 7)
Moore, Edward Small.....MJR; WCS (Note 6)
McClintock, John.....MJR
Markel, Charles H.....SLR
Malone, Gilbert.....SLR
Millard, Jesse C.....SLR
McQuire, John.....RWT
Mather, Carl S.....SLR
McCaffrey, James R.....SLR
Magill, William L.....SLR
McDuffes, William S.....SLR
Miller, Roy G.....SLR
Morris, Roy K.....SLR
McNaughton, John E.....SLR
McCutcheon, Mack D.....SLR
Mayhew, Zeb.....SLR
Meacham, Jerome F. B.....SLR
McCabe, John H.....RWT
MacCalla, John D.....RWT
McAndrew, Shirley.....SLR
McCall, Auston J.....SLR
Mitchell, Richard F.....SLR
Montrose, Ray E.....SLR
Moran, William J., Jr.....SLR
Moreau, Louis A.....SLR
Maynz, Theodore.....FLR
Maffet, John T.....FLR
McGough, William J.....FLR
McHenry, Harold I.....FLR
McCrea, Jarvis S.....CPR
Makepeace, Frank B.....CPR

Russell B. Corey, of New York City, in the French "Foreign Legion"

Meehan, Timothy E.....SLR
Mason, Stephen S.....SLR
Morris, Frederick C.....FLR (Note 1)
McKee, John R.....SLR
Marsh, William A.....SLR
Merriman, Frederick.....SLR
Mills, Charles F.....SLR
Morton, Quin.....SLR
MacLeod, George C.....SLR
Martin, Leslie.....SLR
Mathews, Amos M.....SLR
Millard, Marland B.....SLR
Murray, Verne L.....SLR
McCall, George A.....SLR
Mohr, James H.....SLR
Moon, Frank L.....SLR
Mosier, De Thurston.....SLR
Moulton, Ferris S.....SLR
Martin, Sherman H.....FLR
McAndrew, Shirley.....SLR; VBW
Moran, Jr., William Joseph.....SLR; PFO
Moreau, Louis Alfred.....SLR; SBI

Lieut.-Col. Charles E. Lee, and the Avro biplane in which he recently thrilled Washington

McKinney, Michael A.....FRF
Mead, Theodore S.....UTA
Markham, Robert B.....FRF
McCall, Austin John.....SLR; SMM
Mitchell, Richard Furlong.....SLR; SMM
Montrose, Ray Elleson.....SLR; SMM
Moore, Lucien Waterson.....SLR; SMM
Minor, William McL.....SLR
McCrea, Jarvis Starr.....CPR; AGC
Mulvihill, William Herron.....SLR; EHT
Meyers, Harold.....SLR
MacBey, Sidney John.....SLR; KST
Meehan, Timothy Edward.....SLR; LDT
Morrisay, James Emmet.....SLR; KST
Mitchell, Walter Lewis.....CPR; CSO
Mathews, John E.....REL; RTR
Moody, Alvah E.....REL; RTR
Martin, Herbert D.....SLR
Meigs, Martin S.....SLR
Merz, Charles F.....SLR
Miller, Francis H.....SLR
Montgomery, Edward G.....SLR
Melick, Paul Kieffer.....SLR; EHT
McMurray, Robert J.....SLR; PFO
McCarthy, Emmett Joseph.....SLR; KST
McDermott, Cleveland W.....SLR
McHenry, Harold Irving.....FLR; Note 24
Moffat, Reuben Curtis.....SLR; Note 16
Miller, William H.....Note 20

N

Norris, Howard D.....SLR
Neal, Paul M.....SLR
Nowlen, Stanley.....SLR
Nay, Hollis F.....SLR
Nicoud, George A.....SLR
November, Norman.....RWT
Nelson, Robert R.....RWT
Newman, Charles F., Jr.....RWT
Nave, Jesse L.....SLR
Nelson, Sinius J.....SLR
Nicoll, Edward E.....FLR (Note 1)
Nahm, Edward H.....SLR
Nilos, Edward A.....SLR
Newhall, Cheever H.....FLR
Nay, Hollis F.....SLR; GLC
Newkirk, George H.....SLR
Nelson, Sinius Joseph.....SLR; EHT
Newhall, Cheever Herbert.....FLR; CSO
Nicoud, George Arnold.....SLR; THT
Nunn, Wesley I.....UTA
Nowlen, Stanley.....SLR; EHT
Norton, William M.....SLR
Noonan, Thomas F.....SLR
Neal, Paul Millikan.....SLR; EHT
Nason, Walter Hooken.....REV; WCS; Note 19

O

Oppermann, Charles B.....SLR; AGC
Oatman, Guy R.....SLR; AGC
Ozanne, Porter L.....CPR
Overholt, George T.....SLR
Ohrstrom, George L.....SLR
Oberlin, Gustave W.....SLR
O'Brien, Matthew H.....SLR
O'Niel, James J.....SLR
Ott, Roderick N.....SLR
O'Brien, Ralph M.....FLR (Note 1)
Oler, Wesley H., Jr.....SLR
Ogden, John W.....SLR
Ogilbee, Charles A.....SLR
Olds, James H. S.....FRF
Orbison, William F.....FRF
Orsinger, Gunther.....UTA
Odenthal, Hugo John.....SLR
Overholt, George Torrence.....SLR; EHT
Owens, William A.....SLR

P

Palmer, Millwood J.....SLR
Palmer, Walter.....SLR
Palmer, Burdette A.....SLR
Burnot, Frederick E.....CPR
Pavesich, Francis X.....SLR
Parker, Roy C.....SLR
Powers, Frank E.....FLR
Parker, Walter H.....FLR
Peyton, Harry L.....SLR
Patton, Alexander E.....SLR
Powell, John W.....SLR
Pell, Clarence C.....SLR
Price, Harlow R.....SLR
Parsons, Jay H.....SLR
Parish, Hayward C.....SLR
Pearce, Henry G.....SLR
Page, Richard M.....SLR
Pfaff, Frederick.....SLR
Pike, Lewis F.....SLR
Porter, Harold E.....FLR
Proctor, Charles A.....CPR
Paradise, Victor G.....RWT
Pethick, William.....FLR (Note 1)
Peck, Charles B., Jr.....FLR (Note 1)
Pfaff, Frederick.....SLR; GLC
Pike, Lewis Freeman.....SLR; GLC
Pollock, Granville A.....AAD; CSO
Pierce, Leslie E.....SLR
Parsons, Theodore D.....SLR
Porter, Charles P.....SLR
Purcell, William L.....SLR
Parmer, Oscar S.....SLR
Parry, Maxwell O.....SLR
Page, Walter C.....UTA
Patton, Alexander Ennis.....SLR; CSO
Pond, George K.....SLR
Powell, Archibald W.....SLR
Pickard, Sam.....FRF
Powers, Frank Edwin.....FLR; VBW
Palmer, Walter.....SLR; LDT

Parker, Roy Cecil	SLR; EHT
Place, Fred	FLR
Pearce, Henry G	FLR
Pettigrew, Moses W	REL; RTR
Peabody, Burton Westlin	SLR; KST
Paul, Frank Martyn	SLR; KST
Porter, Harold Everett	FLR; CSO
Pratt, Weldon Granville	SLR; KST
Payne, Owen Street	SLR; GLC
Peterson, Harold George	SLR; EHT
Power, Hugh Cooper	SLR; EHT
Patterson, Robert W	SLR
Patton, Reginald W	SLR
Pearson, John T	SLR
Pascoe, William Henry	SLR; LDT

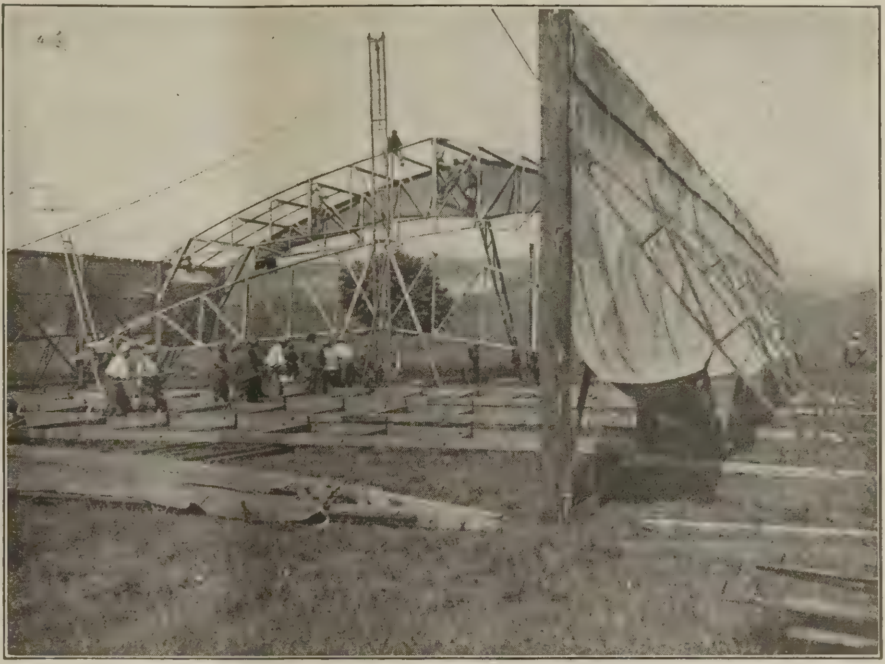
R

Rogers, Guy W	SLR
Ronne, Edwin M	FLR
Rogers, William Dayton	CWS (Note 5)
Roe, Joseph Wickham	REV; WCS (Note 14)
Robards, Charles M	SLR
Rollo, William E	SLR
Ross, Leslie H	RWT
Reitenbaugh, John S	SLR
Richardson, Edward H	SLR
Roberts, Frank L	SLR
Rogalsky, Frederick A	FLR (Note 1)
Roberts, William R	SLR
Rule, William G	SLR
Rand, Stuart C	CPR
Ridley, Oscar T	SLR
Roane, James F	SLR
Rock, Paul C	RWT
Rogers, Francis A	RWT
Renehan, Edward J	RWT
Robbins, Roger S	RWT
Rowland, Charles R	RWT
Reimerth, Charles H	FLR (Note 1)
Rabineau, Franklyn L	FLR (Note 1)
Royce, Stephen W	FLR (Note 1)
Reed, William G	CPR
Richardson, John S	SLR
Robinson, Ralph P	RWT
Rankin, Alfred E	FLR (Note 1)
Ross, Stephen A	FRF
Rothweiler, George W	SLR
Rudd, Guy K	FRF
Romanoff, Charles	SLR
Rearoner, Nathan R	SLR
Ridgely, Arthur O	SLR
Russell, Everetta R	SLR
Ronne, Edwin Mayo	FLR; EHT
Raiguel, William O	SLR
Richards, Marcus D	SLR
Ryan, Arthur W	SLR
Rogers, Guy Wright	SLR; GIT
Rowe, Ralph S	FLR
Rodards, Charles M	SLR; WDO
Robinson, George D	REL; RTR
Randall, Norman B	UTA
Rollo, William Egbert	SLR; WDO
Richards, William E	SLR
Rodman, Sheldon L	SLR
Reber, Alvin D	SLR
Raynolds, John Fiske	Note 23

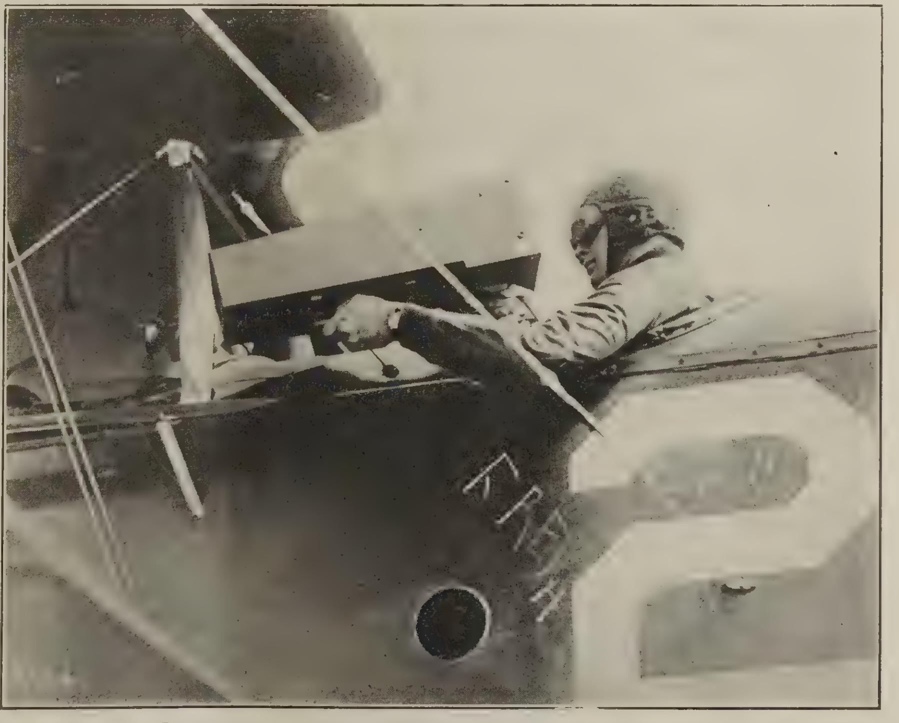
S

Shayes, Fred P	SLR
Stephenson, George E	FLR; GIT
Sweeney, Hart T	FRF
Stoddard, Walter A	SLR; GIT
Shayes, Fred P	MIT
Salisbury, Alfred James, Jr	FLR; CMV
Smith, William D	FLR
St. John, Alvin M	FRF
Sullivan, John Michael	SLR; CMV
Schnur, Philip B	SLR
Smith, Melville D	SLR
Stucklen, Carl Louis	SLR; CSO
Sieg, Leo Paul	CPR; CSO
Sain, James E	SLR; AGC
Shapinsky, Robert B	SLR; AGC
Spell, Robert E	SLR; AGC
Sloan, Kellogg	SLR; GLC
Steward, Edson M	FLR; GIT
Sanders, John N	SLR; AGC
Sieper, Frederick E	SLR; AGC
Smith, Gerald C	SLR; AGC
Speed, John K	SLR; AGC
Sutherland, Paul	SLR; AGC
Smith, George L	SLR
Stamps, Lofton H	SLR; AGC
Smith, Arthur H	PUP
Stephens, Frank March	SLR; GIT
Semmes, Joseph Malcolm, Jr	SLR; WDO
Simpson, William Dudley	SLR; FOB
Sieg, Leo P	CPR
Semmes, Joseph M., Jr	SLR
Seward, Howard H	SLR
Shannon, Torrence T	SLR
Simon, Gerald H	SLR
Smith, Horace J	SLR
Stafford, Seymour S	SLR
Shapiro, Jacob	FLR
Stephens, Arthur J	SLR (Note 11)
Stolze, Charles W	CPR
Sampson, Edwin M	FLR (Note 1)
Shear, Hugh R	FLR (Note 1)
Smith, Orus W	SLR
Simons, Seymour B	SLR
Spates, Thomas G	SLR
Stephens, Arthur J	SLR
Sheffield, Frank H	SLR
Spencer, George S	SLR
Sands, Harold A	SLR
Sprague, Clare W	SLR
Stipp, John C	SLR
Sanborne, Paul F	SLR
Schroeder, John W	SLR
Smith, Albert H	SLR
Sutton, Sherwood	SLR
Squires, Cameron	SLR
Stevens, John H	SLR
Stucklen, Carl L	SLR
Sullivan, John M	SLR
Smith, Maynard L	SLR
Salisbury, Alfred J., Jr	FLR
Spitz, Julian H	FLR (Note 1)
Small, Carlton F	FLR (Note 1)
Stookey, George C	FLR (Note 1)
Scheffler, Eugene M	FLR
Smith, Z. Montford	FLR
Small, Francis B	RWT
Smith, Claude B	SLR
Smith, Claude B	SLR
Sanborn, William H	RWT
Seiler, Frederick E., Jr	FLR
Searing, Hudson R	SLR
Stevens, Charles Z	SLR
Simpson, Walter H	FLR (Note 1)
Snedecor, James L	FLR Note 1)
Sturges, Wesley A	FLR (Note 1)
Symons, William L	CPR
Schenkeisen, Frank G	RWT
Sawyer, George W	SLR
Shaw, Edward P	SLR
Stephens, Frank M	SLR
Simpson, John M	SLR
Stuart, James	CPR
Stewart, John W	UTA
Sheehy, Maurice W	SLR
Spencer, Carlton E	SLR
Stevens, Samuel S	SLR
Street, Jr., Charles E	SLR
Stone, James Austin	SLR;CSO
Schroeder, John W	FRF
Smith, Leonce H	FRF
Stevens, Wade	FRF
Schaefer, J. E	UTA
Shaffer, William L	FRF
Stipp, John C	SLR; SBI
Sands, Harold Aymar	SLR; GLC
Sprague, Clare Wilson	SLR; GLC
Schock, Leland L	SLR
Shattuck, Ray A	SLR
Shawhan, Romer	SLR
Steiner, Harold A	SLR

(Continued on page 70)



Erecting a wooden hangar, reinforced by metal joints, in France



An aeroplane graflex camera is a simple and efficient instrument upon which a large measure of the accuracy of artillery fire depends

CHARACTERISTICS OF THE LEADING AMERICAN AEROPLANES, HYDRO-AEROPLANES, AND FLYING BOATS, 1917-1918

AS a historical record AERIAL AGE takes pleasure this week in presenting a series of tables and diagrams showing the characteristics of the leading American aeroplanes, hydro-aeroplanes, flying boats and aero-motors. Naturally the censorship consequent upon military developments makes it undesirable to present in any form information which would be valuable to the enemy, and therefore the diagrams present only those machines which the Committee on Public Information have permitted us to illustrate during the past year.

TABLE OF CHARACTERISTICS OF THE LEADING AMERICAN AEROPLANES
LAND MACHINES

MAKER	Type of Machine	Wing Span		Chord	Gap	Total Length	Engine H.P.	Speed Range	Gross W'ght
		Upper	Lower						
Aeromarine Company	Training Tractor	37'-0"	33'-0"	6'-3"	6'-6"	25'-6"	Hall Scott-100	78-42	1200
Benoist Aeroplane Company	T 17-Tractor	45'-0"	45'-0"	5'-0"	6'-0"	24'-0"	Roberts-100	64-45	.....
Berckmans Aeroplane Company	Speed Scout	26'-0"	19'-0"	4'-11"	5'-3"	18'-0"	G V Gnome-100	115-54	1190
Breese, Sidney	Penguin	(Monopl.)	....	....	(Monopl.)	....	....	......	.....
Burgess Company	B. P. Primary Trac.	41'-6"	34'-0"	6'-6"	6'-0"	23'-11"	Curtiss-90	......	.....
Chicago Aero Works	Stupar Tractor	38'-0"	26'-0"	5'-0" 4'-0"	5'-0"	20'-6"	50	65-40	.....
Christofferson	Tractor	48'-0"	33'-0"	5'-6"	5'-9"	....	Christofferson	80-40	.....
Continental Aircraft Corporation	Pusher Biplane	36'-0"	36'-0"	5'-3"	5'-3"	22'-0"	Hall Scott-135	95-55	2600
Curtiss Aeroplane Company	Wireless Scout S-2	21'-10"	11'-3"	....	....	....	Curtiss-100	119-	....
Curtiss Aeroplane Company	Triplane Scout S-3	25'-0"	25'-0"	2'-0"	2'-6"	19'-6"	Curtiss-100	115-55	1320
Curtiss Aeroplane Company	J N 4-B Tractor	43'-7"	33'-11"	4'-11"	5'-2"	27'-3"	Curtiss 90	75-43	1890
Curtiss Aeroplane Company	R-4 Tractor	48'-4"	38'-5"	6'-3"	6'-2"	28'-11"	Curtiss 200	90-48	3245
Curtiss Aeroplane Company	Twin J N Tractor	52'-9"	43'-1"	4'-11	5'-2"	29'-4"	(2) Curtiss-100	85-48	3150
Dayton Wright Aeroplane Co.	Training Tractor	....	....	....	....	....	Hall-Scott 100	......	.....
Gallaudet Aircraft Corporation	Convertible Pusher	48'-0"	48'-0"	7'-0"	7'-7"	....	(2) Duesenberg 150	100-	.....
Grinnell Aeroplane Company	Conv. Mono-Bipl	37'-6"	37'-6"	6'-0"	....	....	Robinson-100	75-	1100
Grinnell Aeroplane Company	Parasol	(Monopl.)	36'-0"	7'-0"	....	....	Robinson-100	80-	900
Heinrich Corporation, A. S.	....	....	....	....	....	....	....	......	.....
Lanzius Aircraft Company	Variable Angle	....	....	....	....	....	Duesenberg-100	......	......
Laird Aviation Company	Exhibition Tractor	26'-0"	26'-0"	4'-6"	5'-0"	22'-0"	Anzani-45	63-36	750
Lewis & Vought Corporation	....	....	....	....	....	....	....	......	.....
L. W. F. Engineering Company	Tractor	42'-0"	34'-0"	6'-0"	6'-6"	28'-0"	Thomas-135	......	.....
Lawson Aircraft Corporation	M T-1 Tractor	44'-6"	32'-6"	6'-5"-7'-0"	6'-9"	25'-6"	Hall Scott-100	66-37	1900
Ordnance Engineering Corp	Training Tractor	43'-11"	33'-7"	6'-0"	5'-6"	25'-2"	Duesenberg-100	66-37	2000
Pierce (S. S.)	Sporting Tractor	26'-0"	20'-0"	4'-0"	5'-6"	20'-0"	S. Breese-40	......	630
Richardson Aeroplane Corp	....	....	....	....	....	....	....	......	.....
Shaw Aeroplane Company	Monoplane	30'-0"	(Monopl.)	....	(Monopl.)	22'-6"	....	......	.....
Smith, Kyle, Aircraft Company	....	....	....	....	....	....	....	......	.....
Southern Aircraft Company	Farman Tractor	....	....	....	....	....	....	......	.. ..
Standard Aero Corporation	J-R Pursuit	42'-10"	31'-0"	6'-0"	5'-11"	27'-2"	Hall Scott Special-175	95-48	2400
Standard Aero Corporation	H-3 Tractor	40'-1"	40'-1"	6'-6"	6'-6"	27'-0"	Hall Scott-135	84-46	1700
Sturtevant Aeroplane Company	Steel Battleplane	38'-0"	38'-0"	6'-0"	6'-0"	25'-0"	Sturtevant-150	85-45	.....
Thomas-Morse Aircraft Co.	D-5 Tractor	56'-3"	34'-0"	5'-6"	5'-3"	29'-9"	Thomas-135	86-48	2000
Thomas-Morse Aircraft Co.	Speed Scout	....	....	....	....	....	G. V. Gnome-100	......	.....
United Eastern Aeroplane Co.	Preliminary Trac.	41'-0"	32'-7"	5'-3"	5'-6"	27'-0"	Hall Scott-100	75-40	2300
W. Virginia Aircraft Corporation	....	....	....	....	....	....	....	......	.....
Wittemann-Lewis Aircraft Co.	Model T-T	42'-0"	34'-0"	5'-6"	5'-6"	27'-2"	Hall Scott-90	......	2130
Williams Aeroplane Company	....	....	....	....	....	....	....	......	.....
Wright-Martin Aircraft Corp.	Model R Tractor	50'-8"	36'-10"	5'-6"	6'-0"	26'-8"	Hall Scott-150	86-47	2880
Wright-Martin Aircraft Corp.	Model V Tractor	39'-8"	39'-8"	5'-9"	5'-7"	27'-2"	Hispano-Suiza-150	......	2630

AMERICAN AEROPLANES 1917-1918

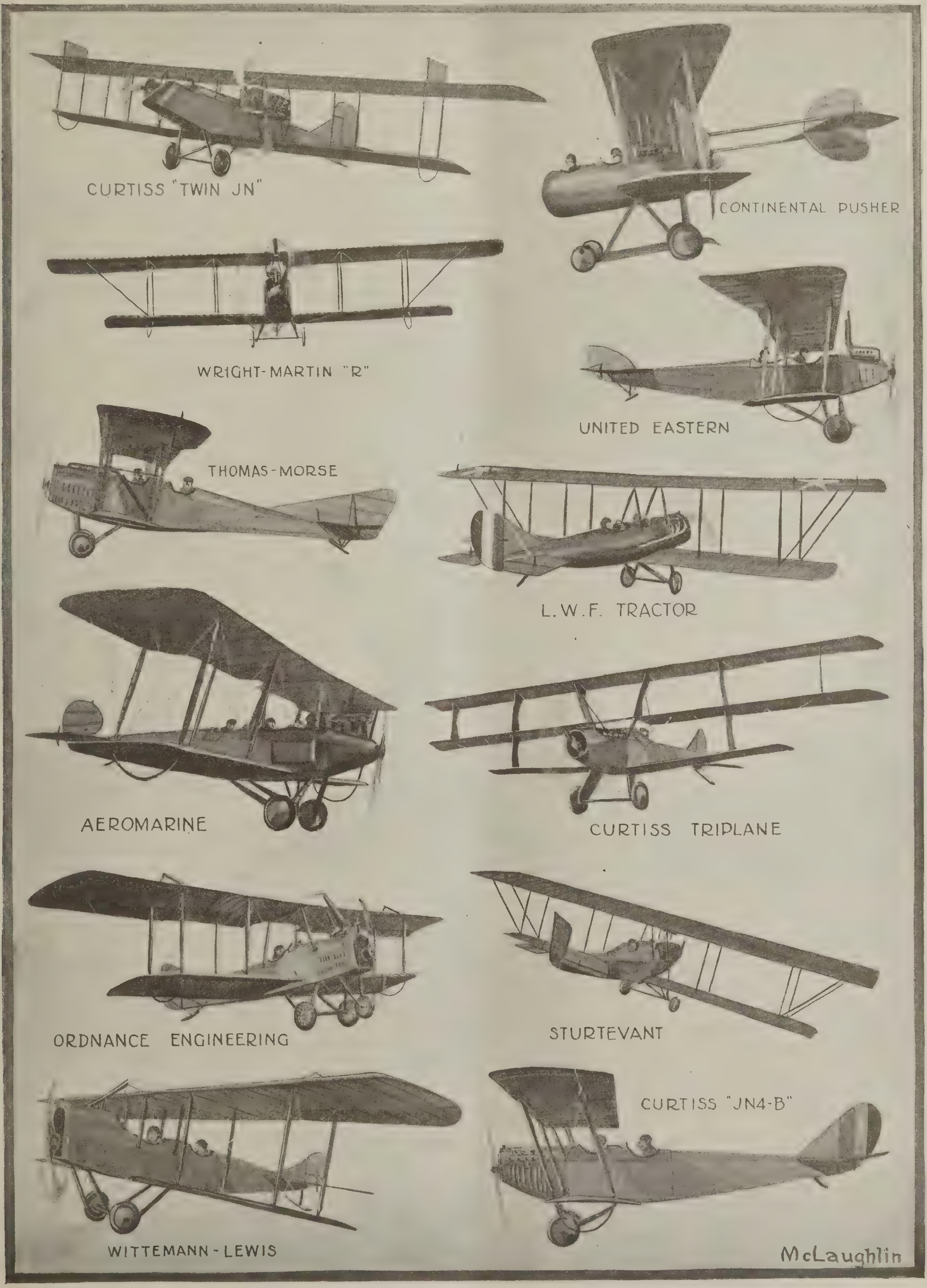


TABLE OF CHARACTERISTICS OF THE LEADING AMERICAN AEROPLANE ENGINES

MAKE	Model	H. P.	R. P. M.	Cylinders	Bore & Stroke (inches)	Carburetor	Magneto	Oiling	W'ght in lbs.	Self Starter
Aeromarine	A-G 6	100	1400	6-Vertical	4 5/16x5⅛	(2) Zenith	(2) Dixie	Force-splash	425	....
Aeromarine	D-12	....	1400	12-V	4 5/16x5⅛	(2) Zenith	(2) Dixie	Force-splash	750	....
Aeromarine	8	100	1400	8-V	3½x5⅛	(2) Zenith	(2) Dixie	Force-splash	450	"Delco"
Ashmusen	Air Cooled	70	900	8-Horizontal	3¾x4½	Ashmusen	Dixie	Force	240	....
Ashmusen	Air Cooled	105	900	12-Horizontal	3¾x4½	Ashmusen	Dixie	Force	345	....
Breese	Radial	40	1400	3-Radial	4 x6	Zenith	....	Force	163	....
Curtiss	O X	90	1400	8-90° V	4 x5	(2) Zenith	Berling	Force	365	....
Curtiss	O X X	100	1400	8-90° V	4¼x5	(2) Zenith	Berling	Force	412	....
Curtiss	V-2	200	1400	8-90° V	5 x7	(2) Zenith	Berling	Force	690	"Perfect"
Curtiss	V-4	300	1400	12-90° V	5 x7	(2) Zenith	Berling	Force	1086	"Perfect"
Duesenberg	....	70	2000	4-Vertical	4⅜x6	Miller	Bosch	Force-Splash	365	....
Duesenberg	....	125	2000	4-Vertical	4¾x7	Miller	Bosch	Force-splash	436	....
Duesenberg	....	300	1400	12-60° V	4⅞x7	Miller	Bosch	Force-splash	1040	Starter
Frederickson	5-A	70	1000	5-Revolving	4½x3¾	Special	Special	....	180	....
Frederickson	10-A	140	1000	10-Revolving	4½x3¾	Special	Special	....	....	....
General Ordnance	L. M.	200	1800	8-V	4¾x6½	Zenith	(2) Dixie	....	876	....
General Vehicle	Gnome	100	1200	9-Revolving	4.33x5.9	Vaporizer	Splitdorf	....	272	....
Gyro	K	90	1250	7-Revolving	4½x6	Spray	Bosch	....	215	....
Gyro	L	110	1200	9-Revolving	4½x6	Spray	Bosch	....	285	....
Hall Scott	A-7	100	1400	4-Vertical	5 x7	(2) Zenith	(2) Dixie	Force	410	....
Hall Scott	A-5	125	1300	6-Vertical	5 x7	(2) Zenith	(2) Dixie	Force	592	....
Harriman	....	100	....	6-Vertical	5 x5	....	....	....	....	....
Kemp	J-8	80	....	8-V	4½x4¾	(2) Zenith	Mea	Force	380	....
Knox	502A	300	1080	12-60° V	4¾x7	(2) Zenith	....	Pressure-force	1400	"Bijur"
Kessler	....	200	....	....	4¾x5	(2) Zenith	....	....	....	....
Macomber	Rotary	....	....	7-Horizontal	....	....	....	....	....	....
Manly	....	53	....	4-Vertical	5x5½	....	....	....	151	....
Maximotor	A-6	85	1600	6-Vertical	4½x5	....	....	....	340	....
Maximotor	B-6	115	1600	6-Vertical	5 x6	....	....	....	385	....
Maximotor	A-8	115	1600	8	4½x5	....	....	....	420	....
Oldfield	15-A	150	1500	....	2⅞x4⅝	Special	Atwater-Kent	Frc. & oil in gas	225	....
Liberty	....	....	....	8	....	....	....	....	....	....
Liberty	....	....	....	12	....	....	....	....	....	....
Liberty	....	....	....	16	....	....	....	....	....	....
Orlo	O-8	125	1400	8-90° V	4½x6	Zenith	Dixie	Force	475	....
Packard	12	225	1400	12-40° V	4 x6	....	....	....	800	"Delco"
Roberts	6-X	100	1400	6-Vertical	5 x5	Rayfield	(2) Optional	Oil in gas	325	Air
Roberts	6-X X	165	1400	6-Vertical	6 x6	Rayfield	(2) Optional	Oil in gas	650	Air
Roberts	E-12	350	1400	12-60° V	6 x6½	Rayfield	(2) Optional	Oil in gas	990	Air
Robinson	Radial	100	1400	6-Radial	5 x6	....	....	....	300	....
Sterling	Sunbeam	350	1400	12-60° V	4 5/16x6 5/16	Special	(4) Special	Force	1058	Air
Sterling	Coatalen	200	1400	8-	4 5/16x6 5/16	Special	(4) Special	Force	475	Air
Sturtevant	5-A	140	1200	8-90° V	4 x5½	Zenith	Bosch or	Force	514	Air
Sturtevant	5-A-4½	210	1200	8-90° V	4 x5½	Zenith	Dixie	Force	508	Air
Thomas-Morse	Thomas-8	135	1200	8-90° V	4 x5½	Zenith	(2) Dixie	Force	630	Air
Thomas-Morse	Thomas-88	150	1200	8-90° V	4⅛x5½	Zenith	(2) Dixie	Force	525	Air
Tone	2 V 9	180	1800	....	4½x6¼	Zenith	Delco	Force-splash	576	"Delco"
Trebert	Revolving	....	....	16-Horizontal	....	....	....	....	350	....
Van Blerck	F-8	124	1400	8-V	4½x5½	....	....	....	....	....
Van Blerck	F-12	185	1400	12-V	4½x5½	....	....	....	....	....
Union Gas Engine	Vertical	120	1350	6-Vertical	....	(2)	(2) Berling	Force	485	....
Wells-Adams	Vee	135	1350	8-V	4½x6	(2)	....	....	....	....
Williams	Vee	125	....	8-90° V	....	....	....	....	....	....
Wisconsin	V-6	140	1380	6-V	5 x6½	Zenith	(2) Bosch	Force	600	Air
Wisconsin	V-12	280	1400	12-V	5 x6½	Zenith	(2) Bosch	Force	1000	Air
Wright-Martin	Hispano Suiza-B	75	1450	4-Vertical	4.72x5.1	Caudel	(2) Splitdorf	Force	315	Starter
Wright-Martin	Hispano Suiza-A	150	1450	8-V	4.72x5.1	Caudel	(2) Splitdorf	Force	445	Starter

A squadron of Spad combat biplanes also used by the Lafayette Escadrille before it was taken over by the United States Army. These brave Americans fought for Civilization beginning with 1915.

AMERICAN AEROPLANES 1917-1918

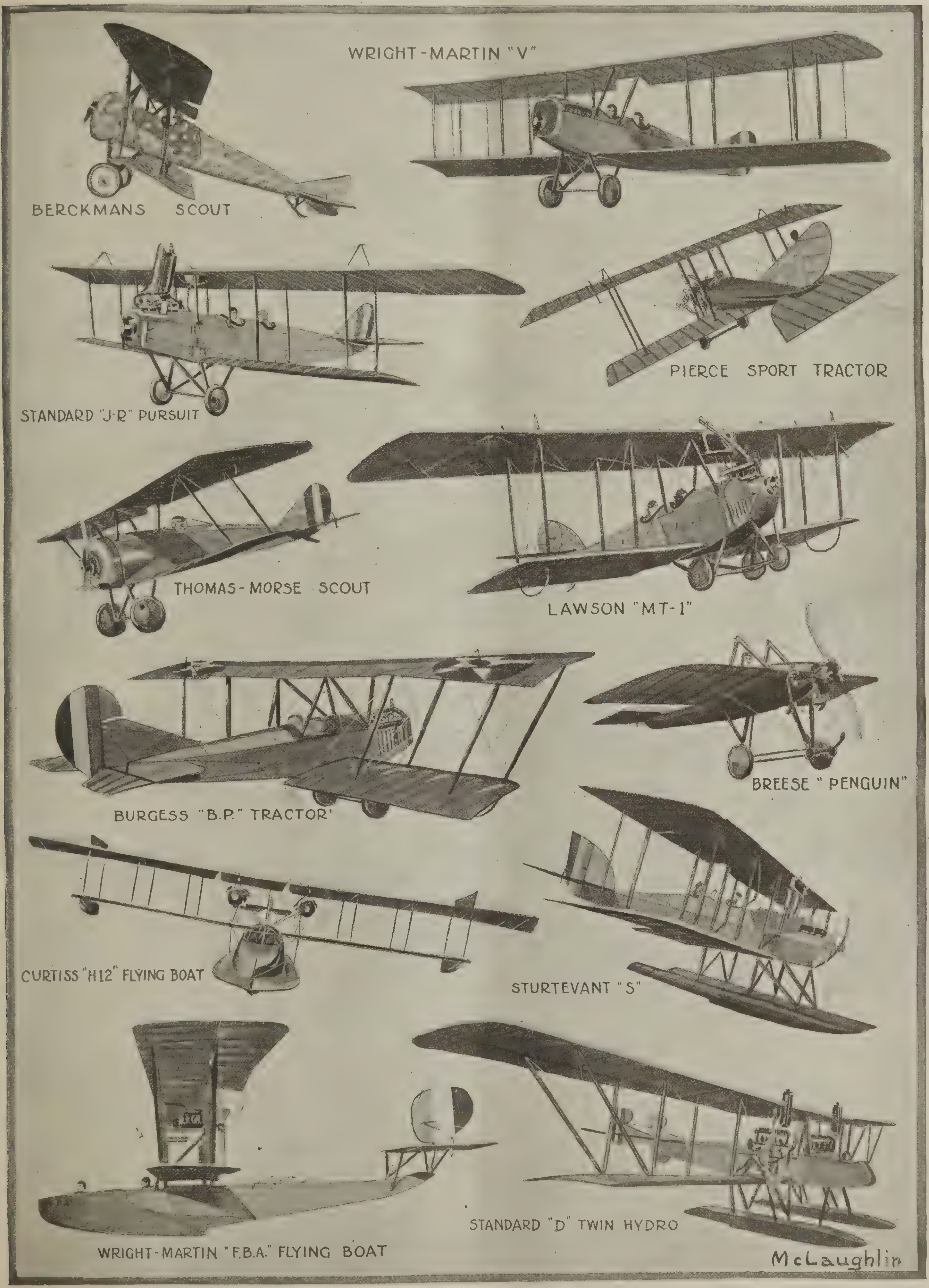
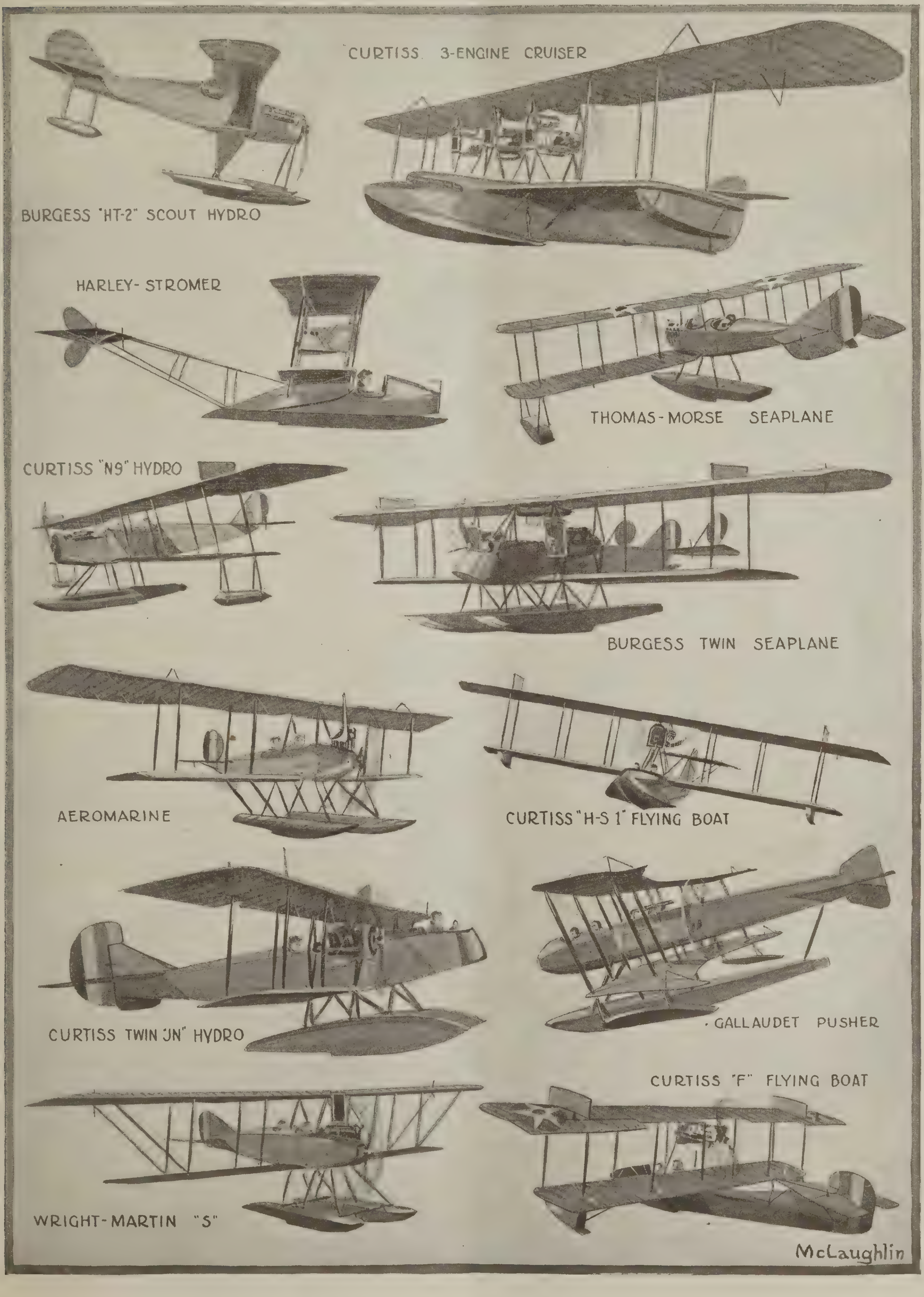


TABLE OF CHARACTERISTICS OF THE LEADING AMERICAN AEROPLANES
WATER MACHINES

MAKER	Type of Machine	Wing-Span		Chord	Gap	Overall Length	Engine H. P.	Speed Range	Gross W'ght
		Upper	Lower						
Aeromarine Company	Seaplane	37'-0"	33'-0"	6'-3"	6'-6"	25'-6"	Hall-Scott-100	78-42	1200
Anglo-American Corporation	....	....	....	....	....	....	....	....	....
Benoist Aeroplane Company	F-17 Flying Boat	45'-0"	41'-0"	5'-3"	6'-0"	27 -0	Roberts-100	66-45	1600
Benoist Aeroplane Company	Model "C" Twin	65'-0"	65'-0"	5'-6"	5'-0" 6'-0"	39'-6"	(2) Roberts-100	60-40	2400
Burgess Company	Twin Hydro	72'-0"	51'-9"	7'-7"	6'-11"	32'-5"	(2) Stuvertant-150	78-45	5308
Burgess Company	Dunne Seaplane	45'-2"	21'-10"	5'-0"	5'-3"	....	S Sturtvant-150	82-50	....
Burgess Company	H-T-2 Scout Hy'ro	34'-4"	21'-6"	3'-6"	4'-0"	22'-3"	Curtiss OXX2 100	95-50	2350
Burgess Company	Type U-Hydro	46'-9"	38'-3"	6'-3"	6'-0"	30'-3"	Curtiss OXX2 100	68-40	2350
Chicago Aero Works	....	....	....	....	....	....	....	....	....
Christofferson Aeroplane Co.	Flying Boat	47'-7"	34'-0"	5'-6"	5'-9"	....	....	....	....
Cooper Aeroplane Company	Training Tractor	33'-0"	22'-0"	4'-6"	4'-6"	....	Frederickson-70	45-35	500
Curtiss Aeroplane Company	Mod F Flying Boat	45'-2"	35'-0"	5'-2"	5'-11"	28'-0"	Curtiss-100	65-45	1440
Curtiss Aeroplane Company	N-9 Hydro'plane	53'-4"	43'-0"	5'-0"	3'-0"	29'-10"	Curtiss-100	70-45	1900
Curtiss Aeroplane Company	Twin J N Hydro	52'-9"	43'-1"	4'-11"	5'-2"	29'-4"	(2) Curtiss-100	85-48	2110
Curtiss Aeroplane Company	Type H-12 Fly Bt	92'-9"	66'-11"	7'-0"	8'-0"	46'-6"	(2) Curtiss-200	85-53	5945
Curtiss Aeroplane Company	H S-1 Fly'g Boat	59'-4"	45'-8"	6'-3"	7'-6"	38'-6"	Curtiss-200	73-52	4205
Dayton-Wright Aeroplane Co.	....	....	....	....	....	....	....	....	....
Flint Aircraft Corporation	....	....	....	....	....	....	....	....	....
Gallaudet Aircraft Corporation	Navy Seaplane	48'-0"	48'-0"	7'-0"	7'-7"	33'-0"	(2) Duesenberg-150	100-	4000
Harley-Strommer	Twin Ford Boat	46'-0"	36'-0"	6'-6" 5'-6"	6'-0" 5'-9"	....	(2) Ford-30	60-35	1000
Heinrich Corporation, A. S.	....	....	....	....	....	....	....	....	....
Janney Aircraft Corporation	....	....	....	....	....	....	....	....	....
Lawrence Lewis Aeroplane Co.	Model A-1-303	42'-0"	....	6'-0"	4'-8"	25'-0"	Hall-Scott-135	....	1750
Lawson Aircraft Corporation	....	....	....	....	....	....	....	....	....
L W F Engineering Company	Seaplane	42'-0"	34'-0"	6'-0"	6'-6"	28'-0"	Thomas-135	....	....
Pacific Aero Products Company	Seaplane	52'-0"	43'-6"	5'-9"	6'-6"	27'-9"	Hall-Scott-135	....	2100
Richardson Aeroplane Corp	....	....	....	....	....	....	....	....	....
Shaw Aeroplane Company	Flying Boat	42'-4"	34'-4"	5'-6"	5'-6"	23'-5"	....	....	....
Standard Aero Corporation	H-3 Seaplane	40'-1"	40'-1"	6'-6"	6'-6"	27'-0"	Hall-Scott-135	84-46	2700
Standard Aero Corporation	....	....	....	....	....	....	....	....	....
Standard Aero Corporation	Twin-Hydro-D	69'-2"	54'-1"	7'-0"	7'-0"	33'-4"	(2) Hall-Scott-135	80-45	3520
Sturtevant Aeroplane Company	S-4 Seaplane	49'-6"	49'-6"	7'-0"	6'-9"	28'-0"	Sturtevant-140	....	2025
Thomas-Morse Aircraft Corp	S H-4 Hydro	....	....	....	....	....	Curtiss-100	65-40	....
West Virginia Aircraft Corp	....	....	....	....	....	....	....	....	....
Wright-Martin Aircraft Corp	Martin "S"	51'-8"	51'-8"	....	....	28'-0"	Hall-Scott-135	75-40	2300
Wright-Martin Aircraft Corp	F.B.A. Flying Bt.	....	....	....	....	....	Hispano-Suiza	....	....

A two-passenger Breguet bombing machine equipped with twin Lewis guns about to land. (French official photo.)

AMERICAN AEROPLANES 1917-1918



EVERY MILITARY AVIATOR OUGHT TO KNOW WHAT HIS OWN AND THE ENEMY'S MACHINE CAN DO AND HOW THEY LOOK

By HENRY WOODHOUSE

Author of the "Text-book on Naval Aeronautics", "Text-book on Military Aeronautics", etc.

"IF you see an aeroplane that does not look like any of the machines shown in this leaflet, you are to make every effort to bring it down."

This, in effect, is the instruction that every French and Italian aviator receives, not only while he is being instructed, but periodically, whether he is at one of the permanent military aerodromes or temporarily stationed on the fronts.

The Allied Governments found it necessary to teach their aviators and students all about their own machines, and as much as possible about the enemy's machines, particularly their appearance. As a basic principle, the aviator is taught that what does not look like one of the Allied machines must be an enemy machine. Therefore, every effort should be made to bring it down.

The anti-aircraft forces are taught the same thing, and that knowledge of the features of the different types of aeroplanes is one of the prime factors in making the anti-aircraft forces efficient.

Lacking that knowledge, both the Allied air forces as well as the anti-aircraft defenses, get confused and permit the enemy to get temporary advantages, which cost the lives of Allied aviators, as well as of the population of the cities which are raided—without mentioning the strategic advantages which the enemy gains through gathering information or surprising the Allies.

It has also been found of extreme importance to have every aviator know what the enemy's machines, as well as one's own machines, can do. It will be recalled that when the first Spad appeared, the German aviators did not give it credit for the speed which it had, so they ventured too much and too far for their own good. The Cicogne Squadron, and the Lafayette Squadron were enabled thereby to maintain supremacy in the air and bring down a number of German aviators, who did not know the fighting characteristics of the Spad.

Unfortunately, the same thing was true when the Germans brought out the Fokker monoplane. For several weeks, before the Allied aviators could be taught the characteristics of the Fokker, the German aviators brought down a number of Allied aviators.

The same was true in the case of the various Sopwith combat machines—and it is true of every new and more efficient type of machine.

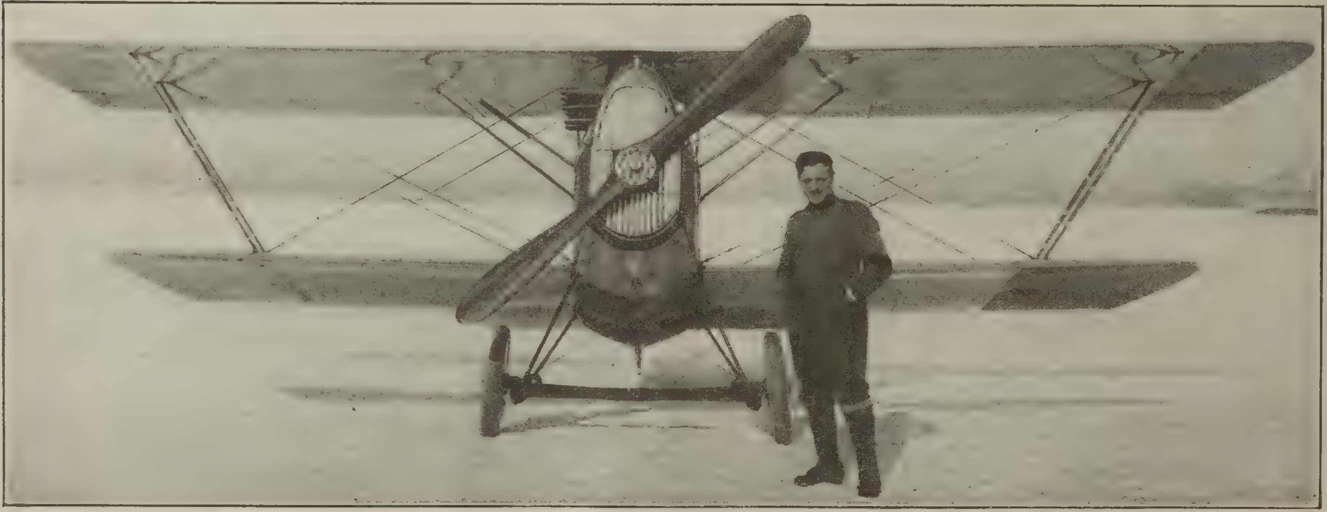
It has also been true in the case of the large bombing machines. Lack of knowledge of their characteristics resulted in many surprises.

In some cases some of the machines which were thought to have "blind sides" were found to have guns mounted in front and rear, and to shoot below as well. An aviator in a single seater fighter would attack what appeared to be a "pusher type," and all at once, a gunner would emerge from the small cock-pit and turn a stream of fire on him.

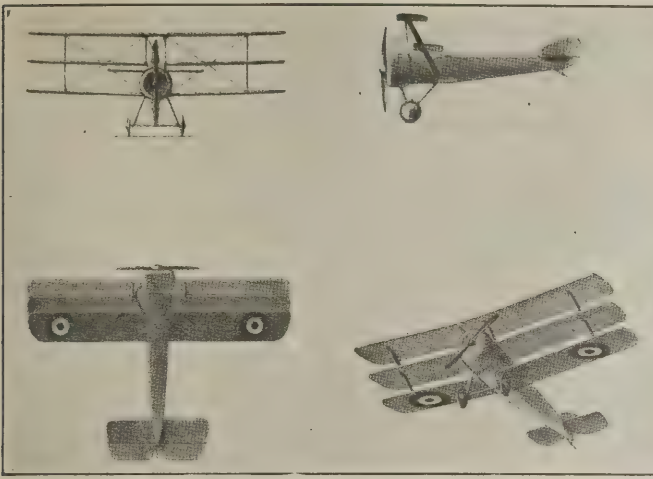
That was also true at the time when the Gothas first came out with the arrangement to shoot below, from the rear. That was an unpleasant surprise to the Allied aviators who attacked them from the rear.

The United States is to train thousands of aviators, observers, aerial photographers and anti-aircraft gunners. Many are taking their preliminary course and thousands are waiting their turns. Thousands more of prospective candidates are not yet of age or have passed the draft age and will volunteer as they learn more about military aeronautics. Military and aeronautic authorities agree that AERIAL AGE can render a valuable service to the nation, by continuing to publish descriptions of machines used by the enemy, as well as by the Allies. In the last case it is necessary, of course, not to publish details of machines which the enemy has not yet captured, or to give details of performances of newly adopted types. In a general way, any type that has not been used in number at the fronts for a period of at least two months must be considered as new and details of performances must not be published.

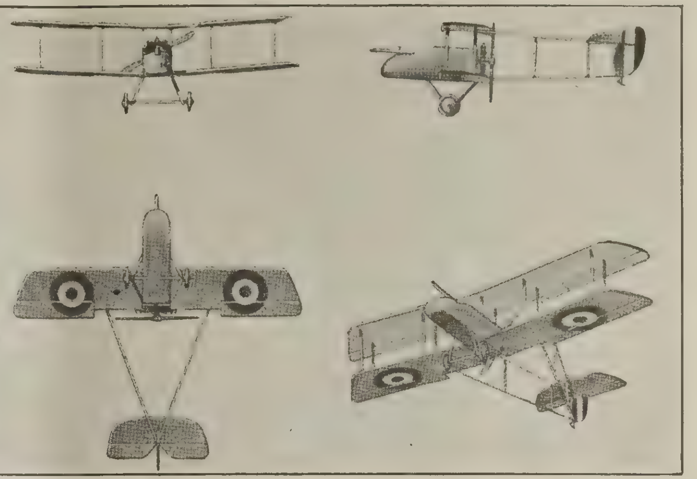
The publication of details of German machines is encouraged: The Boche knows, of course, all about their own types; it also knows how the Allied aeroplanes look as soon as one or two are captured. But it does not always know all about its performances. Therefore, information about performances of new types should be withheld.



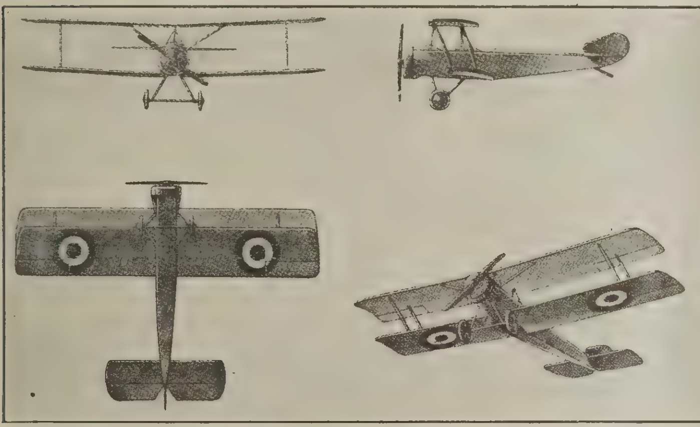
The Pomilio combat plane, said to be the fastest battleplane in existence. (Official Italian Photo.)



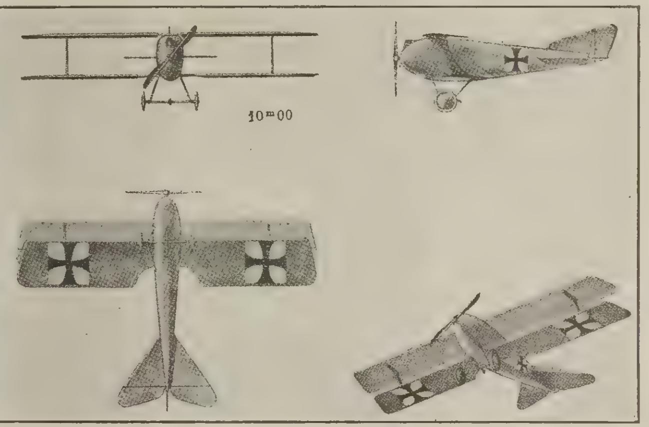
Sopwith Triplane (British). The motor, a rotary Clerget, is completely surrounded by an aluminum cowling. The planes are equal in span, very narrow in chord, and braced by a single strut at either side of the fuselage. Planes highly staggered. Ailerons on all three planes. The only European scout triplane. Said to be very fast



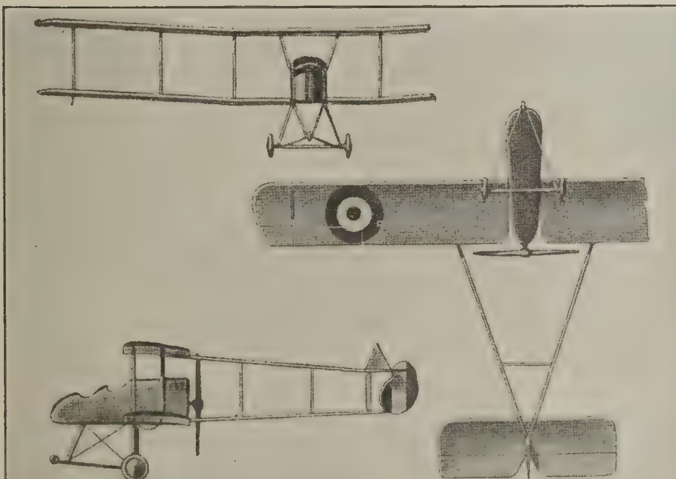
De Havilland 2 (British). Somewhat resembles the F. E. 8, but the outriggers meet one another at the vertical rudder instead of at the tail plane. The small fixed vertical fin, together with the vertical rudder, gives the appearance of a bird's head and beak. A rotary Monosoupape Gnome engine is placed at the rear



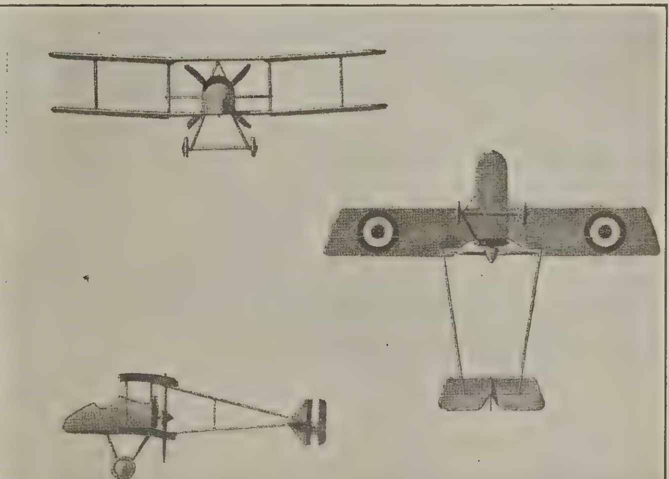
Sopwith single-seater (British). Used by the French and British. Also the Sopwith two seater. Equipped with a rotary engine, Clerget or Rhone. Identified by the central set of struts which stagger outward at the upper end. The fixed triangular fin is rounded off at its leading end. Planes are considerably staggered. Ailerons on both upper and lower planes



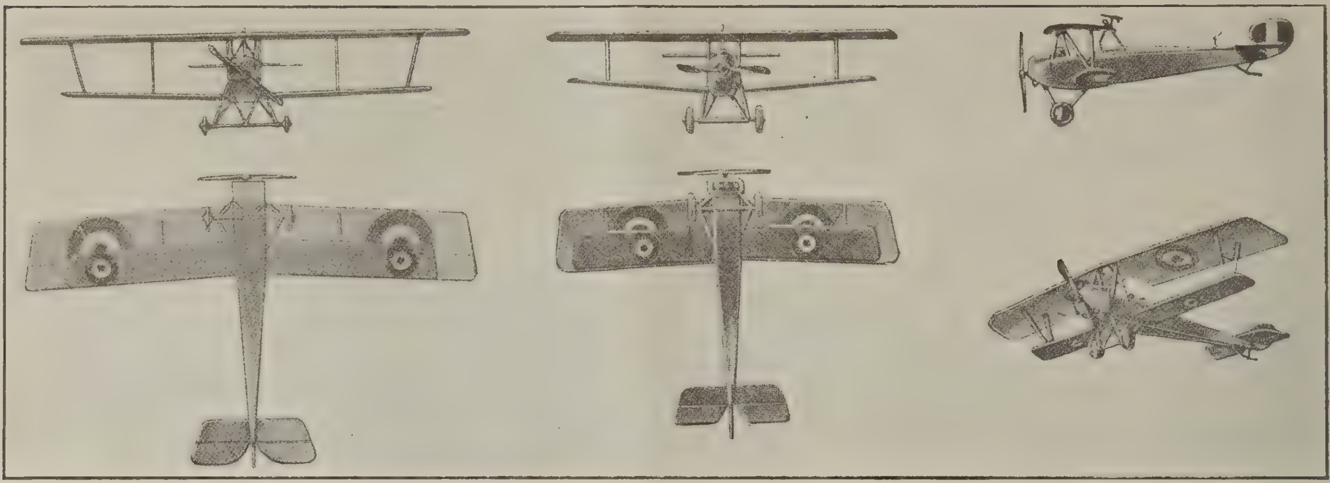
Roland two-seater (German). The engine is a fixed Mercedes, 175 H.P. A machine gun and bombs are carried. The body is exceptionally deep, reaching as high as the upper plane. Windows are provided in the sides of the fuselage for observation. There is but a single interplane strut at either side of the body. Planes are considerably staggered. Fin and rudder placed very high



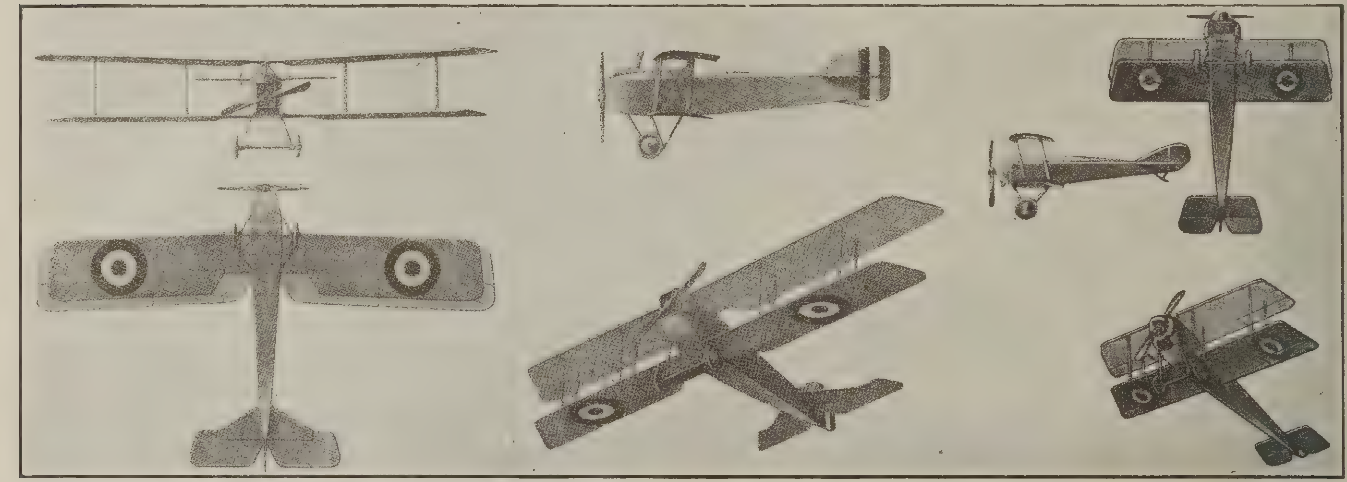
F. E. 2b and 2d (British) (Farman Experimental). Pusher type with a nacelle which carries a fixed Beardmore or Rolls Royce engine. Empennage carried on four outriggers. Landing gear consists of two main wheels and two smaller auxiliary wheels below the forward cock



F. E. 8 (British). Scout type single seater pushr with a rotary Monosoupape-Gnome engine. Fin and rudder area similarly disposed above and below the tail plane. Two wheel landing gear and tail skid below the fin. A movable Lewis machine gun is carried on the deck of the nacelle

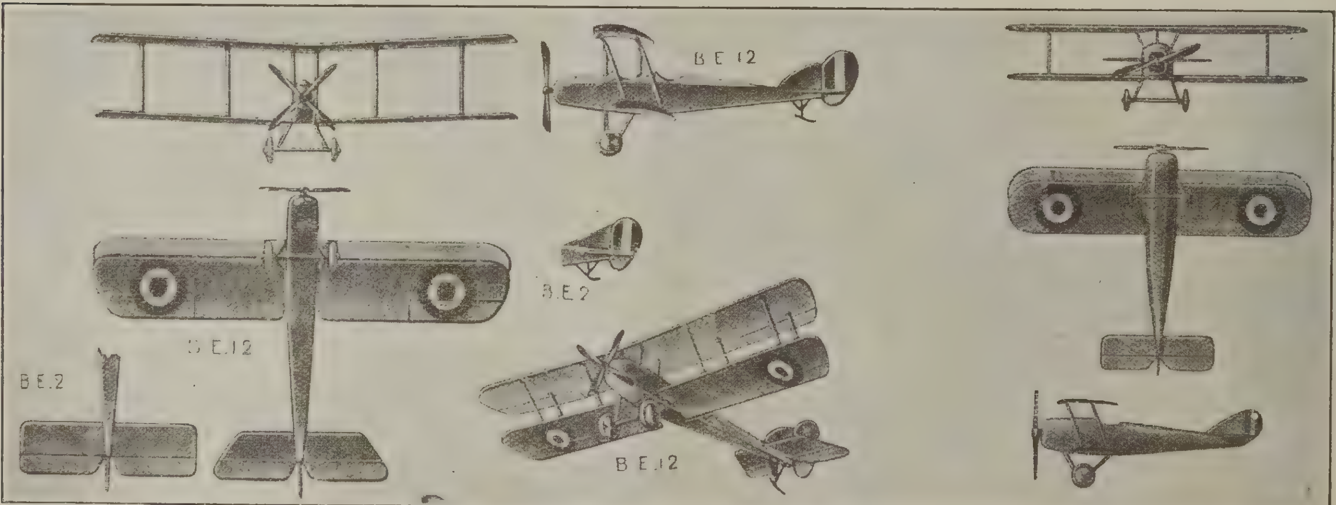


Nieuport. Used by the French, British, Belgians and Italians. Made in single-seater scouts which have rotary Rhone or Clerget engines and having a small wing span, and also two-seaters with fixed Hispano-Suiza engines and a larger wing span. Struts between the planes are V shaped. Two-seaters have two sets of struts at either side, the outer sets inclined outward at the top. Other struts are vertical. The Nieuports are fitted with a belt-fed Vickers machine gun fixed on the fuselage, and a movable Lewis gun mounted on the upper plane. Some of the single-seaters are provided with two Lewis guns in addition to the Vickers



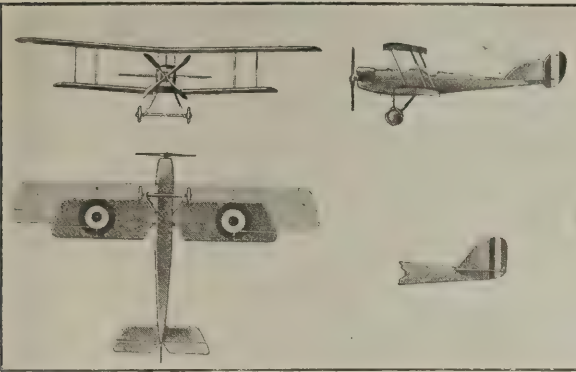
Bréguet Av. (French). Has a fixed Renault engine. Uses a gun firing forward, attached to a strut at the left of the fuselage, and a gun at the rear cockpit. Dihedral on the upper plane only. There are ailerons on the upper and lower planes, the lower ones being exceptionally long and extending from the wing tip nearly to the body. The elevators are balanced

Bristol Scout (British). Called the "bullet". One of the fastest scouts. Uses a rotary Rhone engine. There is also a Bristol two-seater which has 2 pairs of struts at either side of the body. The two-seater is equipped with a fixed engine

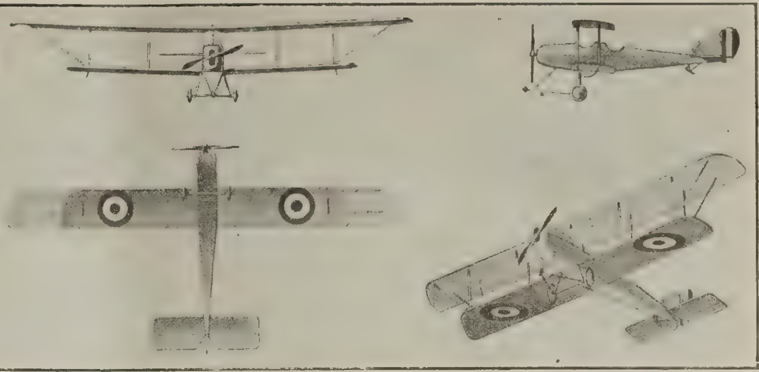


B. E. 2c and the B. E. 12 (British) (Bleriot Experimental). These machines are equipped with fixed R. A. F. (Royal Aircraft Factory) engines with a four-bladed propeller. The planes are staggered and have a pronounced dihedral on both planes

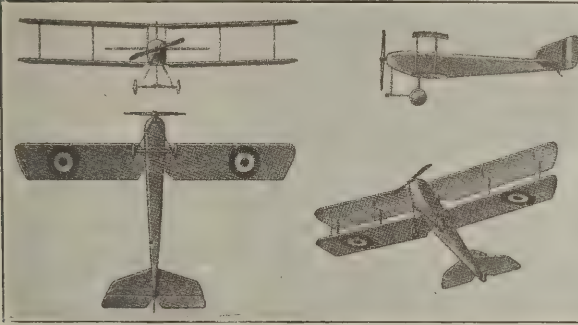
Vickers Scout (British). Rotary Clerget engine. Single pair of struts at either side of the body. Planes equal in area and similar in outline. High stagger. The engine is completely surrounded by an aluminum cowling



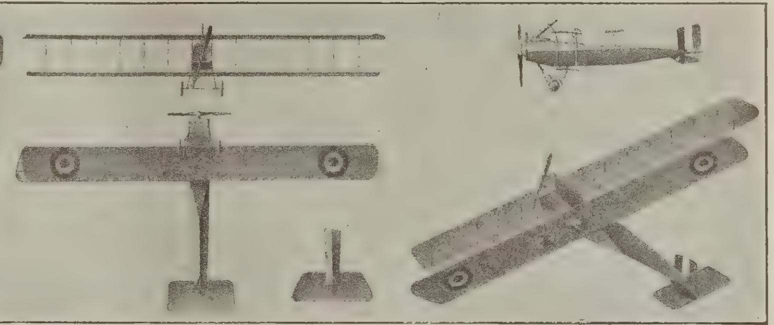
B. E. 2e and R. E. 8 (British). The B. E. 2e has a Hispano-Suiza engine and the R. E. 8 has an R. A. F. engine. There is a single pair of struts at either side of the body, in addition to one strut which connects each pair of ailerons on upper and lower wings



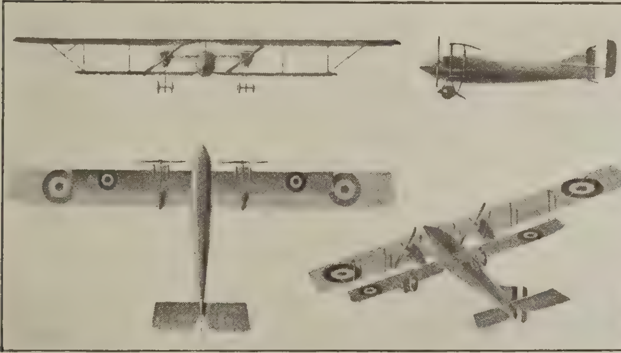
R. E. 7 (Reconnaissance Experimental) (British). Upper plane of greater span than the lower. Two pairs of vertical struts at either side of the body and a pair of inclined struts which carry the overhang. A fixed R. A. F. (Royal Aircraft Factory) engine is used



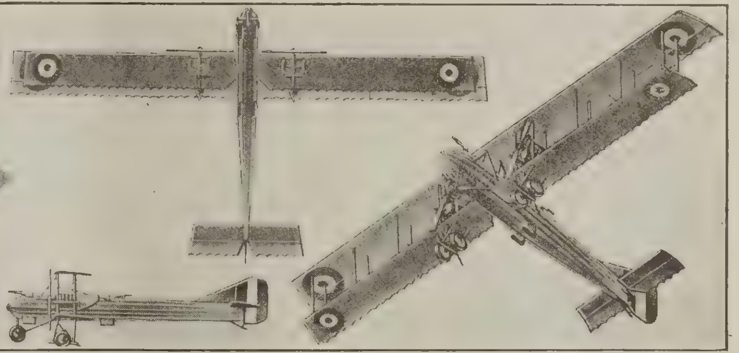
Armstrong-Witworth (British). The engine is a Beardmore. Upper and lower planes are practically similar in shape. They are not staggered nor swept back and have but a little dihedral. Two sets of struts at either side of the fuselage. The fin surface is rather large and carries the rudder quite high. Three wheels are used in the landing chassis



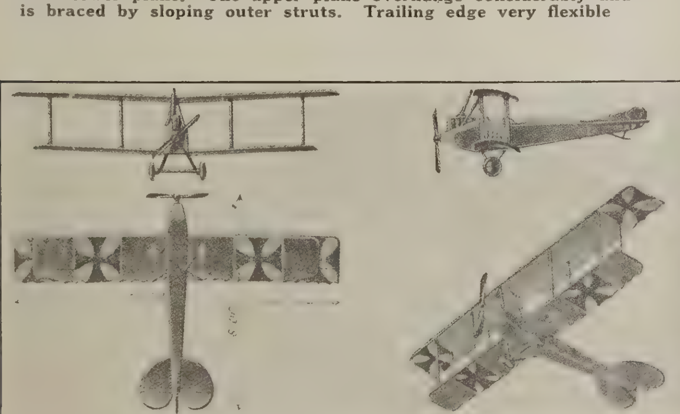
Paul Schmitt (French). Made in two types, the type B. R. A. H. (Bombardment Renault, Ailes hautes) and the B. R. A. B. (Ailes basses). A fixed Renault engine is used, provided with a silencer. The planes of this machine are arranged to be altered while the machine is in flight, changing the angle of incidence according to the lift required. An unusually large number of interplane struts used



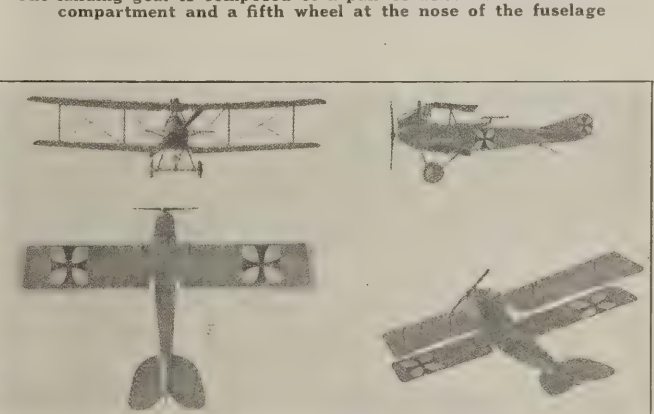
Caudron G.6 (French). Quite similar to the R. 4, but 2 rotary Rhone engines are used. It has only four landing wheels and a very narrow lower plane. The upper plane overhangs considerably and is braced by sloping outer struts. Trailing edge very flexible



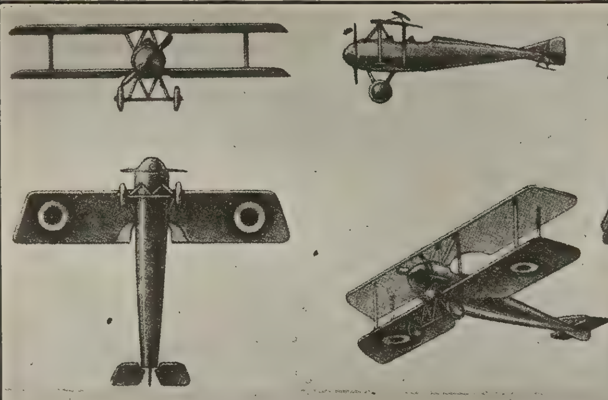
Caudron R. 4. Used by the French and British. Twin motored tractor type with a fuselage. Hispano-Suiza or Renault engines used. The landing gear is composed of a pair of wheels below each motor compartment and a fifth wheel at the nose of the fuselage



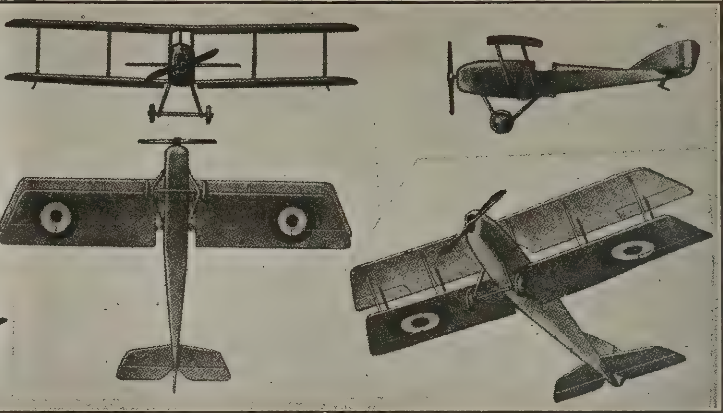
Aviatik (Aviatik-u. Automobil-Gesellschaft) (German). A fixed Mercédès 175 H.P. engine is installed. The familiar exhaust stock carries the gases from the engine and leads them over the top plane



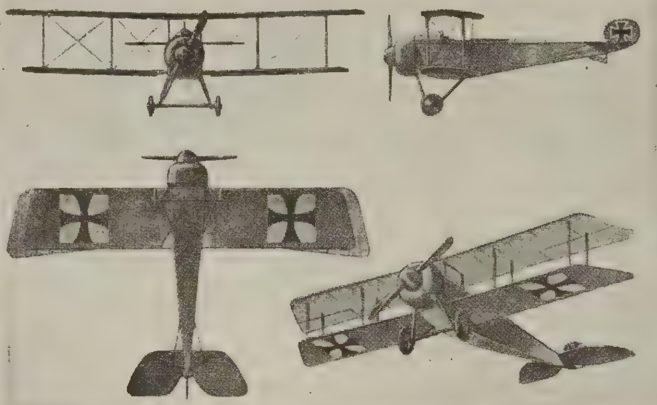
Albatros C.III. A German "all purposes" machine which carries a fixed and movable gun. Radiator carried in the upper plane. Exhaust pipes similar to that of the Aviatik



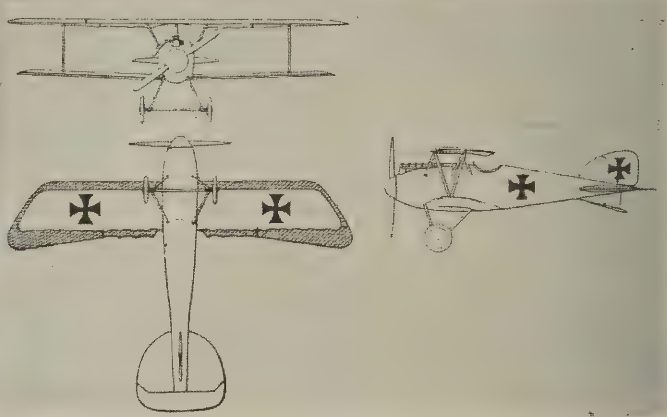
Morane-Saulnier. Employed by the British. A rotary Rhone engine is used, preceded by a streamline noseplate. The undercarriage structure resembles the letter M (initial of "Morane"). There is no fixed tail plane. The elevators are of the balanced type. Sometimes mistaken for the Fokker or Halberstadt, which are imitations of it



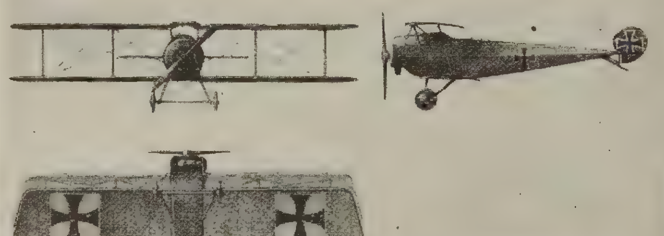
Martinside (British). Engine is a fixed Beardmore. Ailerons on upper and lower planes which are about equal in span. The tail plane is narrow in comparison with its span



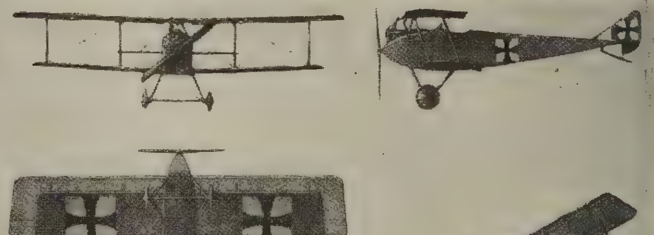
AGO (Aktien Gesellschaft Otto). A German single-seater. Rotary Oberursel engine with propeller spinner or nose-piece. The vertical rudder is balanced much in the manner of the French Nieuport. The upper plane is but slightly greater in span than the lower and both planes have practically the same chord, whereas the Nieuport has a narrow lower plane



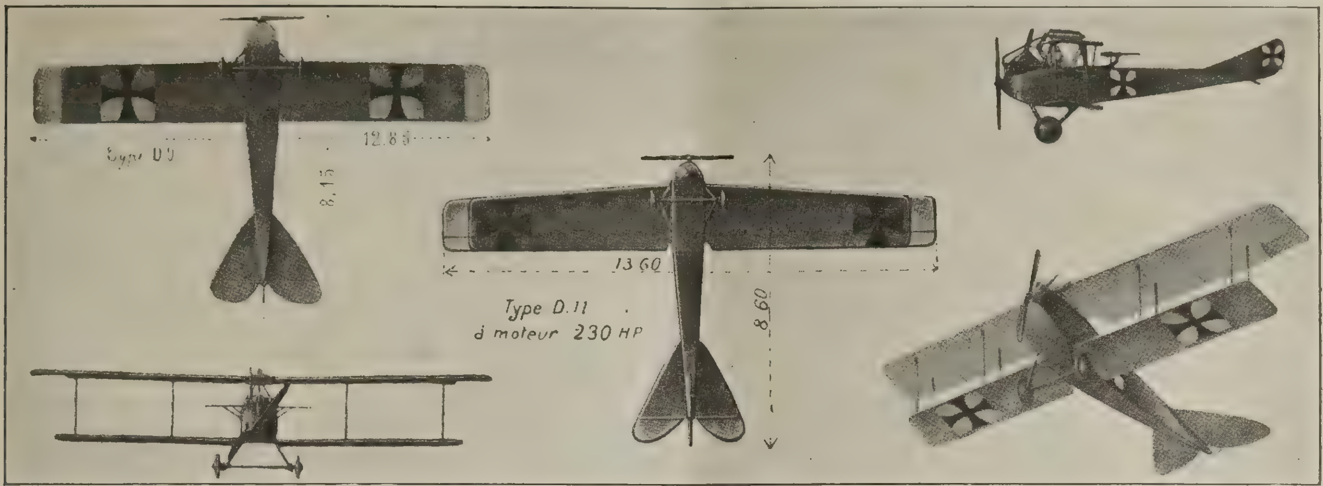
Albatros D.III (German). Single seater scout equipped with a vertical Mercedes engine. Very apt to be mistaken for a Nieuport, as it has V struts and a narrow lower plane. It has, however, a high vertical fin and an under-fin tail skid. This machine is one of Germany's fastest scout aeroplanes, the type used by the famous "Flying Circus" which for a time had things their own way in the sector at which they were stationed. Their best maneouver is the dive, which is easily accomplished because of its great weight. When it comes to climbing, the Albatros is no match for French or British machines of the same type.



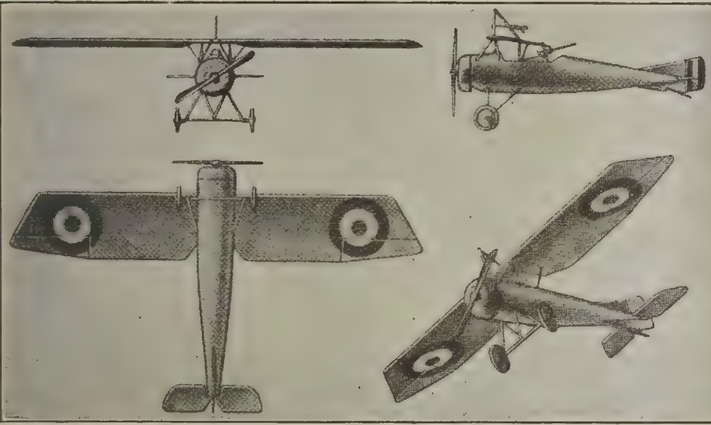
Fokker (German). Single seater scout machine, with a rotary Oberursel 100 H.P. or a fixed Mercedes 170 H.P. engine. This machine is very similar to the Morane-Saulnier, but is distinguishable by its comma-shaped balanced directional rudder and its two pairs of interplane struts. Evidently its constructors appreciate the value of adhering to Morane-Saulnier lines



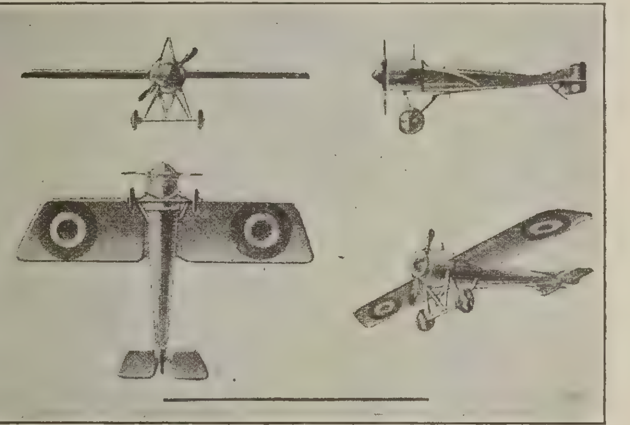
Halberstadt (German). Single seater equipped with a fixed Argus or Mercedes engine. The planes are staggered 1' 6", and the upper plane slightly overhanging, thereby differing from the Morane. Overall length, 24' 0". Span, upper plane, 28' 6"; lower plane, 25' 10". Chord, both planes, 5' 2". Gap, 4' 4". The balanced tail flaps measure 10' from tip to tip, and are 2' 4" wide



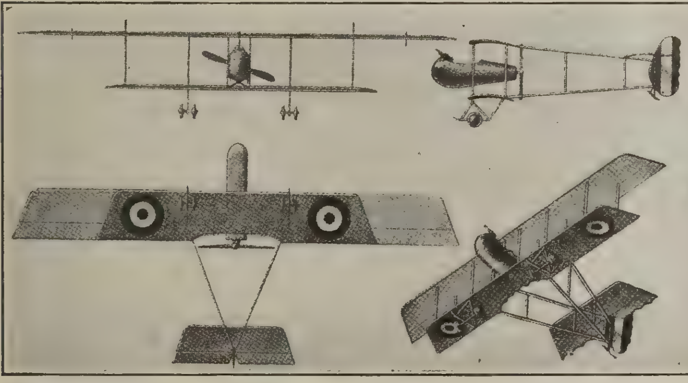
L. V. G. (Luft-Verkehrs-Gesellschaft) (German). Made in two types: Type "D9" which has a 175 H.P. Mercedes or Benz engine and Type "D11" having a 235 H.P. engine. Distinguishable by its "half-negative" ailerons and the long span of the D11, the wing chord of which is greater near the body than at the wing tips



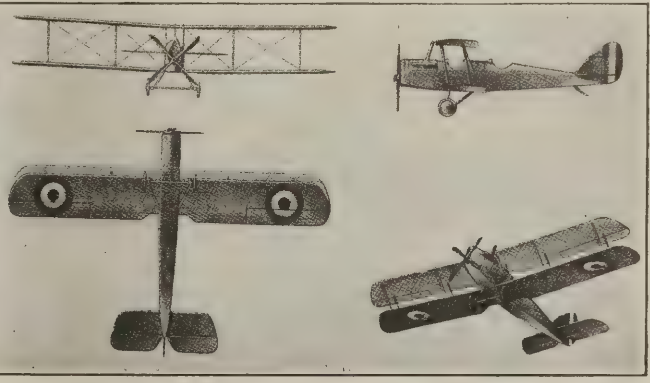
Morane-Saulnier monoplane (used by French and British). The Parasol type is equipped with a rotary Rhone engine and resembles the Morane-Saulnier biplane. Two guns are carried, one above the plane and one resting on the fuselage



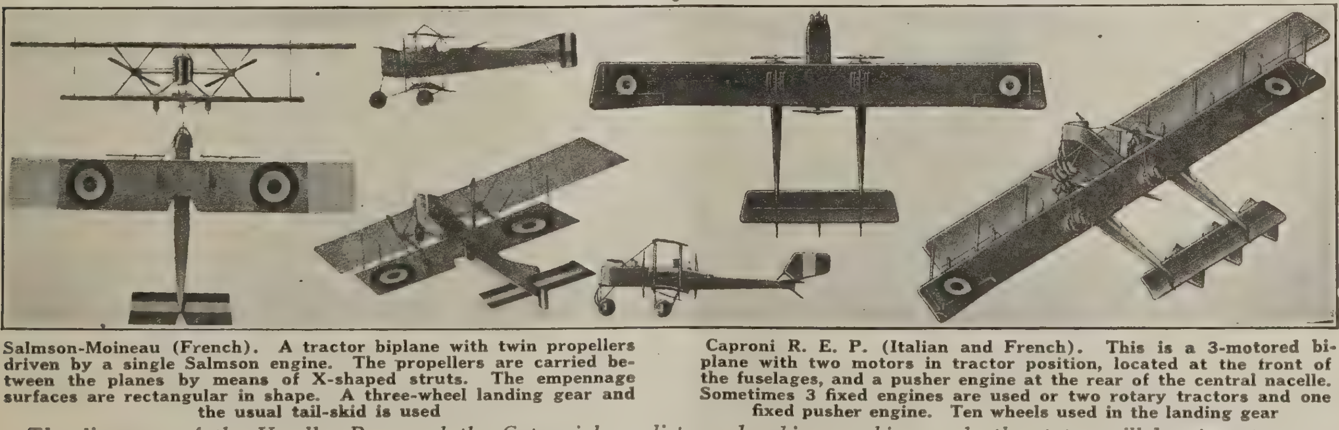
Morane-Saulnier monocoques 11 and 13 mq. In this machine the pilot's vision is above the plane. It has a very small lifting surface, and is often mistaken for the German Fokker. One of the fastest monoplanes of the present war



Farman Fréres F. 40 (French). A pusher type biplane with a fixed Renault or Lorraine-Dietrich engine. The nacelle is situated above the lower plane. Lower plane has the same chord, but about one-third less area than the upper. Ailerons on the upper plane only.



De Haviland 4 (British). Uses a V-type engine and four-bladed propeller. Planes are slightly staggered, but not swept back and very slight dihedral. Two pairs of struts used at either side of the fuselage. A balanced type rudder used



Salmson-Moineau (French). A tractor biplane with twin propellers driven by a single Salmson engine. The propellers are carried between the planes by means of X-shaped struts. The empennage surfaces are rectangular in shape. A three-wheel landing gear and the usual tail-skid is used

Caproni R. E. P. (Italian and French). This is a 3-motored biplane with two motors in tractor position, located at the front of the fuselages, and a pusher engine at the rear of the central nacelle. Sometimes 3 fixed engines are used or two rotary tractors and one fixed pusher engine. Ten wheels used in the landing gear

The diagrams of the Handley-Page and the Caproni long distance bombing machines and other types will be given in the next number of Aerial Age.

STANDARDIZED SPECIFICATIONS FOR LUBRICATING OILS

By C. W. STRATFORD, President Dixie Chemical Corporation

IN all industries the tendency toward standardization has never been stronger than at present. Under stress of war, international standardization committees are now the order of the day. The work done by these committees has been fruitful in securing the highest degree of quality, suitability and manufacturing efficiency. The oil industry appears to be one of the few remaining in which no effective standardization has been brought about. It is generally recognized that there is real need for some dependable method or methods of distinguishing between good and poor lubricating oils.

The advent of internal-combustion engines has introduced a new and important element in the lubrication of machinery, namely, much higher operating temperatures. Oils in these engines not only are exposed to high temperatures, but also are brought into intimate contact with carbureted air and products of partial or complete combustion, which contaminate them.

When the science of internal combustion-engine design was in its early stages little attention could be spared for the proper study of explosion-engine lubricants. As this type of engine approached perfection a difference in lubricating oils was soon perceived in service. Engine manufacturers soon found that certain oils gave good results while others were unsatisfactory. As their chief task, however, has been to produce engines, and not oils, their attention has been concentrated exclusively within their own field. In rare instances some engine manufacturers have made exhaustive experiments with lubricating oils, assuming that such oils bought in lithographed tins would always be of uniform quality if called by the same trade name. This assumption, erroneous on their part, has resulted in the complete nullification of much good that might have been derived from such engine tests. Unfortunately, intelligent tests cannot be made on lubricating oils in heat engines unless they are planned and carried out by operators who thoroughly understand all the features of internal combustion engine operation, as well as the fundamentals of hydrocarbon chemistry and the important secrets of the oil-refining industry. Lubricating efficiency and oil quality are distinctly a chemical matter, hence any specification seeking to limit quality and to definitely fix suitability and uniformity must repose upon a strictly chemical or physico-chemical basis.

There are so many variables in the operation of internal-combustion engines that unless all tests are run under carefully studied and uniformly limited conditions no comparison can be made with the results obtained from the lubricants in practical use. Because of the difficulty and of the great expense attached to the execution of such tests it is obvious that they should be supplanted by some laboratory methods which would make possible the determination of the same qualities and defects that are brought into unmistakable evidence in properly run engine tests or in actual service.

One of the first attempts to establish such laboratory tests was made by trying to apply the heat and the emulsion tests in the determination of the practical service value of lubricating oils. Oils that permanently emulsify with distilled water were found to rapidly decompose when used in an engine. Hydrocarbon oils showing a poor emulsion test also always suffer an undesirable decomposition when exposed to heat. Increased familiarity with these two tests soon proved to oil refiners that the best public demand was for engine oils that showed up most favorably under such tests. But the indications of these two tests were proved to be too limited to serve as a basis for judging all oils. When no "sulpho" compounds or highly unstable hydrocarbon compounds were present, the results obtained were negative. Consequently, other tests had to be evolved that would indisputably and definitely prescribe the stability (meaning resistance to chemical change) and and the suitability (correct volatility for the operating conditions) of all oils for use in internal-combustion engines.

In the light of the most recent study and exhaustive experimentation, the oxidation test appears to be the only dependable and satisfactory method by which the stability of oils can be predicted when they are used in service. The main facts shown by this test are the evaporation loss and the rate at which solid hydrocarbons are formed by polymerization or precipitation when oils are exposed to working conditions of an engine.

The distillation of finished oils under a high vacuum offers an unfailing means of determining their constituents; that is, of what groups of hydrocarbons, highly volatile or less volatile, the finished oils may consist. This test is a useful supplement to the oxidation test.

In the oxidation test oils are exposed to a uniform high temperature and the surface of the oil under test is swept by a continuous current of air, thus duplicating actual conditions to be met with in an engine.

Fractionation under conditions of high vacuum is an excellent method of making an approximate analysis of finished lubricating oils, since it permits of separating the volatile from the less volatile portions in graduated fractions. When oils show high evaporation loss the oxidation test alone cannot explain the reason for this loss. Evaporation may occur because of natural volatility or because of the occurrence of "cracking"—that is, decomposition of the oil into light portions and heavy liquid or solid hydrocarbon residuals.

CUSTOMARY ROUTINE TESTS

Before giving an extended description of the apparatus and the method of making the test it is, perhaps, well to discuss certain routine physical tests that have become traditional to the oil industry and to the oil consumer.

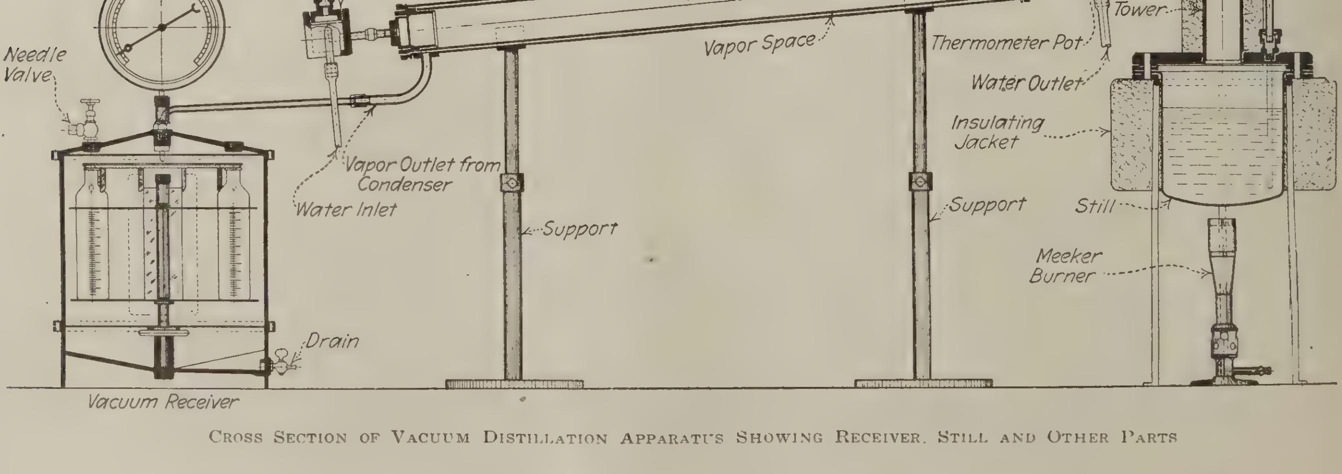
The problem of differentiation between groups of hydrocarbons sold under trade names is a different matter when viewed from the angle of the oil refiner, as compared to that of the final consumer. The oil refiner must have some practical tests that suffice for his purpose, but that during the processing of his distillates may enable him to produce oils having uniform properties.

A perfect knowledge of his crude oil, as well as a familiarity with all of the distillates from that crude oil, automatically build up for the refiner a series of standards which, though significant to him, are meaningless to the consumer. In most instances these standards are of little value to other oil refiners who are handling crudes of different characteristics. The meaning of these customary routine tests—gravity, flash, fire, viscosity, cold test and color—may be taken as examples. By these tests oil refiners accustomed to handling some specific crude or mixtures of crudes soon become so familiar with their distillates as to be able to condemn or approve any distillate in any stage of refining.

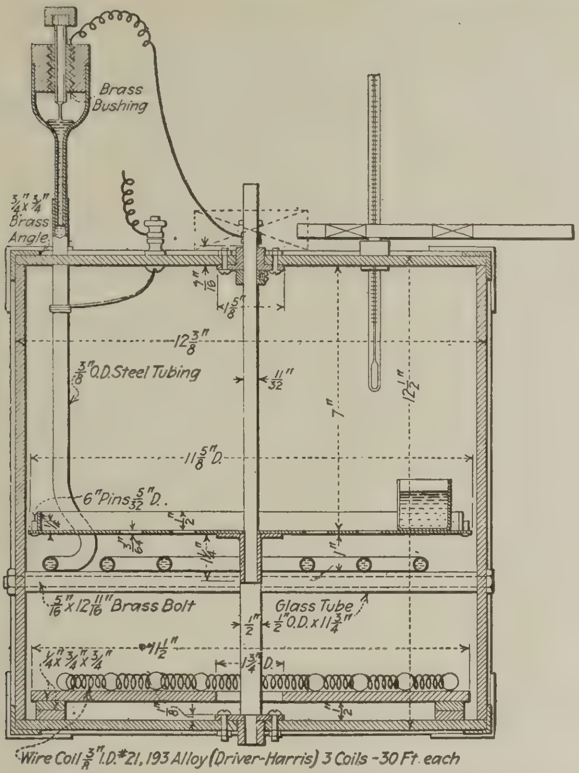
Gravity Test.—The first separation of crude oil into its distillates is usually controlled by their gravity. This test also indicates to the oil refiner the geographical source of the crude oil. Formerly, all oil refiners judged the quality of the light volatile products, such as fuels for engines, by gravity alone. Present-day developments, however, have shown that this is not a proper indication of volatile fuel characteristics. Gravity, as applied to any petroleum product, is of no practical significance to the consumer.

....

The flash test is used by oil refiners as a measure of volatility. The very lightest products, such as gasoline, are not controlled by a flash determination. The flash point of all other distillates and residues is generally used as an indication for necessary separation of distillates into their required fractions. The flash test made on products not contaminated is an indication of the same property as shown by the fire test. When the products are contaminated the fire test shows more nearly the real constituents of the oil examined.



CROSS SECTION OF VACUUM DISTILLATION APPARATUS SHOWING RECEIVER, STILL AND OTHER PARTS


Brass Bushing
$\frac{3}{4}$"x$\frac{3}{4}$" Brass Angle
$\frac{7}{16}$"
1$\frac{5}{8}$"
12$\frac{3}{8}$"
$\frac{3}{8}$" O.D. Steel Tubing
$\frac{11}{32}$"
7"
12$\frac{1}{2}$"
11$\frac{5}{8}$" D.
6" Pins $\frac{5}{32}$" D.
$\frac{1}{2}$
$\frac{3}{64}$
1$\frac{1}{4}$"
1"
$\frac{5}{16}$"x12$\frac{11}{16}$" Brass Bolt
Glass Tube
$\frac{1}{2}$"
$\frac{1}{2}$" O.D. x 11$\frac{3}{4}$"
1$\frac{1}{2}$"
$\frac{1}{4}$"x$\frac{3}{4}$"x$\frac{3}{4}$"
1$\frac{3}{4}$" D.
$\frac{1}{8}$
$\frac{1}{2}$
Wire Coil $\frac{3}{8}$" I.D. #21, 193 Alloy (Driver-Harris) 3 Coils - 30 Ft. each

Cross Section of Oxidation Oven

Neither flash nor fire tests are of major importance to the consumer because the real volatility of oils, as determined by distillation under high vacuum, gives him a true measure of oil economy in service.

Cold Test.—The cold test is usually applied only to lubricating oil fractions, and is employed by the refiner to control the finishing of his products. It is of importance to the consumer in determining the suitability of oils for use under certain climatic conditions.

Viscosity Test.—The viscosity of his products is of concern to the oil refiner only in so far as it may be required to meet the demands of the consumer. Through practical experience the consumer has learned what the correct viscosities of lubricants should be for different types of machinery.

Color Test.—As the petroleum industry developed, certain products were gradually accepted as standard because of their most obvious characteristic, color. It has long been customary to include the color value of an oil as a necessary marketing requisite, along with its other properties. The refiner takes the color of oils into consideration as being a valuable indication of their uniformity, it being also a check on correct processing. Although in the past color was was considered as an indication of purity, it has been demonstrated beyond any doubt that it alone means nothing in service to the ultimate user.

The unusually rapid development of aviation engines, and their importance for war purposes, have been the direct causes for further investigation and the carrying out of intensive study of the relative qualities of all available lubricating oils in the American market, special and otherwise, intended for use in automobile, truck and aircraft engines. In continuing this study, naturally, due consideration was given to routine oil testing as now made by oil refiners. Of these tests, gravity, flash, fire and color were soon eliminated as being non-essential, because they gave no decisive indication of the decomposition of an oil when exposed to heat. The viscosity, cold test, volatility, susceptibility to oxidation, and emulsifying properties were substituted as being the only tests actualy required. These five tests have been found to prescribe completely and accurately the stability and suitability of lubricants for the above-mentioned engines.

Recommended Lubricating Oil Specifications

The following specifications, which are recommended by the author for lubricating oils to be used in internal-combustion engines, are based on the five tests determined to be essential. In order to put them into force it would be absolutely necessary to standardize the apparatus used in the determination of all the properties indicated. This also applies to the standardization of petroleum ether. Given below are a description of this apparatus and the specifications of the petroleum ether, both of which are recommended for standardization.

The nomenclature used for designating the specifications is as follows: Aircraft engine oils, A. E. O.; automobile and truck engine oils, A. T. O.; and Knight sleeve-valve engine oils, K. S. V. O. The air-cooled motorcycle engine oils are not given a separate designation, since the oils specified for other duty can be used.

AIRCRAFT ENGINES

A. E. O. No. 1 (High Altitude or Low Altitude Winter)

1. Viscosity at 212 deg. fahr., seconds............58 to 70; desired 65
2. Cold test..................................Maximum 40 deg. fahr.
3. Boiling-point range........Maximum 4 per cent under 300 deg. cent.
4. Oxidation.......................Insolubles, maximum 0.20 per cent
   Evaporated loss, maximum 40 per cent
5. Emulsion ....Maximum trace

A. E. O. No. 2 (Low Altitude Summer)

1. Viscosity at 212 deg. fahr., seconds............80 to 90; desired 85
2. Cold test..................................Maximum 45 deg. fahr.
3. Boiling-point range........Maximum 4 per cent under 300 deg. cent.
4. Oxidation.......................Insolubles, maximum 0.20 per cent
   Evaporation loss, maximum 40 per cent
5. Emulsion ....Maximum trace

AUTOMOBILE AND TRUCK ENGINES

A. T. O. No. 1 (Summer)

1. Viscosity at 212 deg. fahr., seconds............52 to 60; desired 55
2. Cold test..................................Maximum 35 deg. fahr.
3. Boiling-point range.......Maximum 30 per cent under 300 deg. cent.
4. Oxidation.......................Insolubles, maximum 0.30 per cent
   Evaporation loss, maximum 40 per cent
5. Emulsion ....Maximum trace

A. T. O. No. 2 (Winter)

1. Viscosity at 212 deg. fahr., seconds............45 to 50; desired 48
2. Cold test..................................Maximum 30 deg. fahr.
3. Boiling-point range........Maximum 30 per cent under 300 deg. cent
4. Oxidation.......................Insolubles, maximum 0.30 per cent
   Evaporation loss, maximum 50 per cent
5. Emulsion ....Maximum trace

KNIGHT SLEEVE-VALVE OIL

K. S. V. O. (Summer)

1. Viscosity at 212 deg. fahr., seconds.........100 to 120; desired 115
2. Cold test..................................Maximum 52 deg. fahr.
3. Boiling-point range........Maximum 3 per cent under 300 deg. cent.
4. Oxidation.......................Insolubles, maximum 0.20 per cent
   Evaporation loss, maximum 30 per cent
5. Emulsion ....Maximum trace

Winter, use A. E. O. No. 2

AIR-COOLED MOTORCYCLE ENGINES

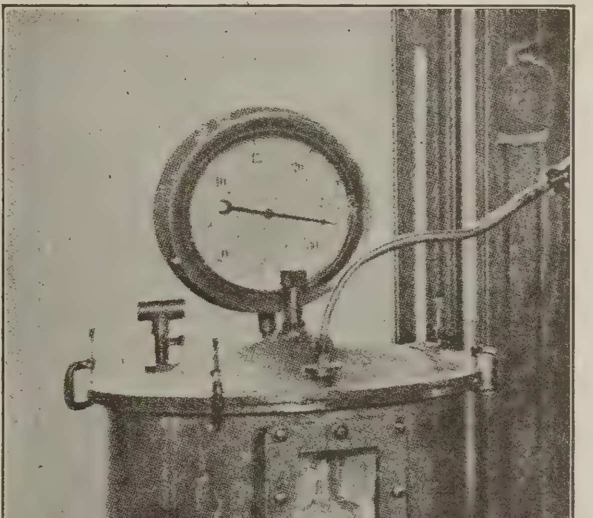
Winter—One- and two-cylinder types, use A. E. O. No. 2.
Four-cylinder types, use A. T. O. No. 1.
Summer—One- and two-cylinder types, use K. S. V. O.
Four-cylinder types, use A. E. O. No. 2.

I. Viscosity

It will be necessary to determine only the viscosity at 212 deg. fahr. For the purpose of a more thorough investigation the rate of fall of viscosity between low and high temperatures, three points may be found: 100, 150 and 212 deg. fahr.

Care should be exercised in maintaining the temperature of the oil being run at 212 deg. fahr.

The instrument used will be a standard Saybolt universal viscosimeter. Limit of error plus or minus one second.



Receiver for distillation apparatus

II. Cold Test

The cold-test box (18 by 18 by 14 in. high) is filled about three-quarters full with ice and salt mixture (about 10 to 1 by volume). Copper cylinders 9 in. high, and having an inside diameter of 2 in., are inserted in this mixture so that the tops of the cylinders are about level with the surface of the ice and salt mixture. Regular 4-oz. oil sample bottles and approximately 5-in. immersion, cold-test thermometers, having a range of from 20 to 140 deg. fahr., complete the equipment. The procedure of test is as follows:

A sample bottle is filled about one-third full of oil, and a cork, carrying the thermometer, inserted in the neck of the bottle so that the bulb of the thermometer is immersed in the oil. The sample is then placed in one of the copper cylinders. The bottle should not be allowed to come in contact with the bottom of the tube, a thin section of cork being interposed between the two. The temperature of the oil, as shown by the thermometer, is carefully observed, and at each drop of 2½ deg. fahr. the sample is removed and examined. The temperature at which the oil just refuses to flow when the bottle is held in a horizontal position is taken as the cold test.

The above method is for oils having a cold test under 40 deg. fahr. Those having cold tests above this point are tested as follows:

The point at which the oil just refuses to flow is obtained in exactly the same manner as described above, and the oil is then chilled 20 deg. fahr. below this point. The sample is then removed and placed in water which is kept just 5 deg. warmer than the oil, as shown by the thermometer in the bottle. The sample is tested at each 2½ deg. fahr. increase in temperature, and the temperature at which the oil will flow evenly across the bottle when it is held in a horizontal position is called the cold test.

The limit of error is plus or minus 2 deg. fahr.

Annapolis Pour Test.—The procedure is exactly the same as that given above for oils under 40 deg. fahr. cold test, except that 5 deg. fahr. is added to the point observed as cold test and is reported as pour test.

The above method is used for all oils except black oils. The cold test for black oils is taken at the Annapolis Experimental Station as follows: The oil is chilled by exactly the same procedure as above; when the oil just refuses to flow the sample is removed, the bottle held horizontally and the oil stirred with the thermometer. The temperature when the oil flows freely is recorded as the pour test.

A. S. T. M. Pour Test.—The method specified by the A. S. T. M. is exactly the same as that used at the Annapolis Station, except that the sample shall be removed and tested for every 5 deg. drop in temperature, instead of 2½ deg. fahr., as used at Annapolis. The difference between the A. S. T. M. and Annapolis methods is about 2 deg., and generally the Annapolis method will give the higher test.

III. Boiling-Point Range (Vacuum Distillation)

The apparatus for making this test consists of a special steel still and vapor tower, a special water-cooled condenser and chamber for the distillate receivers. The position of these receivers can be adjusted from the outside without alteration of the pressure in the distillation system. The distillation system is connected with a pump capable of maintaining a vacuum of 2½ mm. absolute and having a capacity of 6 cu. ft. per minute.

The still is charged with 2000 cc. of the oil under examination. The standard vacuum, 40 to 50 mm. absolute, is established throughout the closed system, and heat applied to the bottom of the still. For the purpose of the specification it will be necessary to carry the distillation only to the point at which the still temperature has reached 300 deg. cent. (572 deg. fahr.). The percentage of distillate up to 300 deg. cent. has been arbitrarily taken as a basis for judging the relative volatility of different lubricating oils. However, for the ultimate analysis of finished lubricating oils, the distillation may be continued up to the point where nine-tenths of the total charge will have passed over, the rest being allowed to remain in the still, and estimated as residual.

The fractionation of finished lubricating oils under high vacuum is a satisfactory way of determining boiling-point limits with the least de-

Properties of Representative American Lubricating Oils for Use in Internal Combustion Engines

Kind of Oil	*Physical Properties Fresh Sample*								*Lovibond Color*		*Vacuum Distillation*	*Oxidation Oven*		
	Baume Grav.	*Flash, Deg. F.*		Deg. F. Burn	Deg. F. Chill	*Viscosity, Seconds*			Fresh	After Heat Test	% Dist. Under 300° C.	% Evap. Loss	% Insol.	% Varnish
		Open Cup	Closed Cup			100° F	150° F	212° F						
Aerial Oil	29.1	425–	410	490	50	593	176	71	550–2	670–2	13	18.98	0.0240	0.1875
Amalie Special	31.0	420	425	490	40	209	80	43	430–6	500–2	4	31.71	0.0220	0.3300
Atlas Aerul Heavy	27.6	460	460	540	47	868	228	85	400–½	600–½	328° I.B.P.	17.84	0.0120	0.1081
Cadillac Detroit Lt.	28.2	405	...	470	11	190	69	...	300–6	.....	44	.....	......	......
Duplex No. 350	30.7	425	435	495	27	194	77	46	240–6	250–2	1	21.49	0.0596	0.1760
Havoline														
Light	25.9	370	380	430	33	173	66	42	540–6	300–½	22	62.93	0.5500	0.6300
Medium	25.0	385	395	450	34	237	80	46	570–2	500–½	6	57.74	0.8600	0.3400
Heavy	25.6	395	410	455	46	361	111	54	480–2	300–½	18	40.49	0.1500	0.2800
Mobiloil														
Zeta Light	28.0	375	380	430	31	141	62	42	360–6	200–½	28	51.75	0.3010	0.3816
Zeta Medium	24.2	400	410	470	43	255	84	47	460–2	300–½	29	35.06	0.2599	0.2776
Zeta Heavy	25.6	420	425	480	42	476	137	62	500–½	650–½	301° I.B.P.	27.64	0.0404	0.2339
"E" Light	26.1	370	380	420	0 @ 0	167	66	44	430–6	400–2	21	76.44	0.1962	0.1580
"A" Medium	21.8	360	360	420–	24	330	97	49	660–2	320–½	21	57.66	0.6381	0.1612
"B" Heavy	26.3	500	470	580	41	1640	397	122	800–½	950–½	3	25.26	0.1766	0.1500
Arctic Lt. Med.	23.3	370	380	425	6	221	74	45	280–6	400–2	28	71.52	0.3993	0.4759
Arctic Medium	21.1	370	385	430	8	300	87	46	550–6	210–½	19	49.06	0.4160	0.5065
"BB" Med. Hvy.	25.8	460	...	540	46	926	243	86	670–½	800–½	344° I.B.P.	18.67	0.0290	0.0560
Monogram														
Light	27.6	360	360	410	20	140	60	41	200–6	260–2	14	67.12	0.4600	0.5700
Medium	26.0	375	370	430	23	289	95	50	600–6	250–½	16	46.19	0.1600	0.2600
Heavy	28.9	430	445	505	34	340	108	55	600–6	580–2	306° I.B.P.	25.75	0.0700	0.3600
Ex. Hvy	24.7	465	425	555	58	1583	356	110	330–½	470–½	3	12.10	0.04400	0.2056
Oilzum														
Heavy	29.1	430	440	500	30	261	91	50	460–6	420–2	310° I.B.P.	15.86	0.1167	0.1357
Crystal G. E. Oil	17.0	505	490	590	2	1080	244	85	100–6	140–2	....	17.54	......	......
Perfection														
"A" Light	29.1	400	410	470	26	181	71	45	420–6	430–2	314° I.B.P.	49.36	0.1378	0.2387
"B" Medium	24.9	390	400	450	32	243	81	47	440–2	480–½	2	52.33	0.3704	0.2629
"C" Heavy	29.3	420	430	495	40	316	103	54	480–2	300–½	2	27.53	0.0088	0.2292
Polarine, New Jersey	24.6	395	...	470	6	221	77	42	150–6	850–2	57	48.73	0.6200	0.4300
Quaker State Medium	28.8	440	450	520	21	301	102	48	600–6	700–2	29	22.42	0.0640	0.1700
Service Auto Oil	24.3	390–	...	460	33	195	72	44	500–2	440–½	7	58.91	0.9600	0.4100
Socony														
Zero	24.3	395	410	470	Sl. @ 0	219	77	46	140–6	250–2	3	42.85	0.1531	0.2167
Polarine Hvy	25.4	385	380	450	35	300	103	51	380–2	420–½	7	38.61	0.1353	0.2128
Supreme														
Light	22.3	325	315	360	S. @ 0	137	57	39	420–6	250–2	73	60.21	0.7689	0.3531
Medium	19.8	330	330–	380	Sl. @ 0	217	73	43	530–6	220–½	49	56.57	0.7041	0.3243
Heavy	19.4	330	330	370	0 @ 0	242	73	44	560–6	200–½	42	53.37	0.4609	0.3063
Texaco														
Light	21.3	335	340–	380	Sl. @ 0	205	69	42	190–6	260–2	44	56.13	0.1395	0.2371
Medium	20.9	350	350	400	Sl. @ 0	301	85	46	190–6	350–2	31	51.40	0.1009	0.2163
Heavy	19.3	355	360	420	10	495	119	51	330–6	450–2	19	42.87	0.0874	0.2097
Ursa	19.7	390	365	455	Sl. @ 0	735	152	58	240–6	360–2	....	37.63	0.2757	0.3562
Valvoline Medium	30.7	385	390	440	30	257	93	51	480–2	300–½	29	38.85	0.0250	0.1714
Veedol														
Aero No. 1	26.2	455	450	535	39	795	212	78	580–2	300–½	3	34.96	0.3956	0.1504
Aero No. 2	27.1	450	445	530	38	814	222	80	580–2	310–½	3	36.58	0.1614	0.1900
Aero No. 3	26.3	435	435	520	38	517	149	63	470–2	260–½	318° I.B.P.	37.98	0.0358	0.1738
Aero No. 4	27.6	440	430	515	34	513	151	64	500–2	250–½	3	38.11	0.0416	0.2130
Aero No. 5	24.7	440	450	520	28	413	135	55	470–6	580–2	336° I.B.P.	38.33	0.0741	0.4151
Aero No. 6	24.7	460	460	540	27	474	134	58	480–6	550–2	318° I.B.P.	18.91	0.0732	0.2284
Zero Light	26.1	390	...	460	14	199	75	44	380–6	370–2	57	39.56	0.4548	0.2717
Medium	26.3	405	...	475	30	250	88	48	530–6	520–2	23	49.54	0.0201	0.2348
Heavy	26.2	410	...	480	33	329	107	52	700–6	650–2	28	30.08	0.0650	0.1719
Extra Heavy	26.1	465	...	550	44	...	355	111	310–½	450–½	3	9.02	0.0464	0.1155
Waverly	31.0	400–	405	460	24	160	69	40	300–6	570–2	37	44.76	0.1400	0.2900
White Star Motor Oil	25.8	360	370	415	18	170	66	43	500–6	800–2	17	59.65	0.4800	0.7500
Wolf's Head														
Light	31.2	390	...	445	34	142	62	40	130–6	210–2	1	58.70	0.1750	0.4800
Medium	28.8	410	...	470	26	223	82	46	410–6	350–¼	310° I.B.P.	45.05	0.3800	0.2700
Heavy	28.6	415	...	475	32	334	108	52	480–6	750–2	304° I.B.P.	35.50	0.2100	0.2000
No. 8	27.6	465	460	550	46	1196	300	100	680–6	380–½	3	38.83	0.0470	0.2960

composition. The quantity of low-boiling-point fraction varies widely in lubricating oils intended for use in different types of internal-combustion engines. All engines that operate under approximately full load and at high temperatures (aviation engines) should contain a minimum quantity of low-boiling-point fractions, say 4 per cent distilling under 300 deg. cent. The results obtained by actual tests in aircraft engines clearly demonstrate this point. On the other hand, passing from such conditions of high operating temperatures to those of widely varying and comparatively low operating temperatures (passenger cars and trucks), it is necessary to increase materially the quantity of low-boiling-point fractions to prevent serious carbonization. There is a limit, however, to the addition of low-boiling-point fractions, for the reason that too large a quantity will greatly increase the specific consumption of the lubricant in service, hence some mean value must be fixed upon, a permissible balance being struck between carbonization and high consumption. An analysis of the most successful automobile oils now sold shows that not over 30 per cent of the oil should distill below 300 deg. cent. in the vacuum distillation apparatus described. This volatility is a guarantee of a reasonably low specific consumption, good lubrication and minimum carbonization within the explosion chambers.

Oxidation Test

The apparatus for making the oxidation test consists of a cubical box constructed of heat-insulating material. Through the vertical axis of this box passes a shaft, at the center of which is attached a disk of about 11 in. diameter. This disk and shaft are rotated at a speed of 25 r.p.m. The containers for oil samples are steel cups cut from the solid, 50 mm. inside diameter, plus or minus 0.04 mm.; and 50 mm. high, plus or minus 0.4 mm. The cup wall is 1 mm. thick. The oven is electrically heated by resistance coils, and the temperature is maintained constant and regulated by a thermostat. Air circulation is provided through holes in the bottom of the sides of the oven and through the top. The determinations made in this oven are:

1. Evaporation loss.
2. Petroleum ether insolubles.
3. "Varnish."

Fifty grams of the oil are weighed into the cups, and these are placed at equal distances at the outer edge of the rotary disk. The temperature is brought to 225 deg. cent., and the test is continued at this uniform temperature for twelve hours, in two periods of six hours. The samples are then removed and allowed to cool, weighed, and the loss in weight (per cent) recorded as evaporation loss. The contents of the cups are then washed through a Gooch crucible with standardized petroleum ether (see below) until the filtrate is colorless. From the crucibles on which remain the insoluble residue the petroleum ether is allowed to evaporate, after which they are introduced into a Freas oven and thoroughly dried at a temperature of 105 deg. cent. The weight of the residue is then determined and the percentage recorded as petroleum ether insolubles.

When the metal cups have been thoroughly washed with petroleum other there still remains a varnish-like residue, which clings to the upper walls. The weight of this substance is determined and recorded as "varnish."

The real significance of "varnish" values has not been clearly established up to the present. Poorly refined oils, however, also those from some mid-continent and from California crudes, usually show high "varnish" values.

The maximum variation of checked results on evaporation loss and petroleum ether insolubles should not exceed 2 per cent.

It has been found that the evaporation loss of an oil does not always coincide with its boiling-point range; therefore, it seems permissible to conclude that the evaporation loss is a measure of the decomposition of an oil, as well as of its volatility. In judging oils it is important to observe carefully the relation between the boiling-point range and the evaporation loss. For example, an oil may have a high boiling-point range, and yet, owing to its instability, may readily decompose when exposed to heat, and thus show a high evaporation loss.

The petroleum ether insolubles indicate, on the one hand, the solid carbonaceous matter formed in an oil, which splits up, when exposed to heat, into light volatile ends and solid products. On the other hand, these insolubles may indicate the precipitation of colloidal carbon or other products in improperly refined oils. Values of petroleum ether insolubles may be entirely independent of those of boiling-point range or evaporattion loss.

Standardized Petroleum Ether

For the determinations of petroleum ether insolubles it is imperative that a standardized petroleum ether be employed, such as the following:

Petroleum ether should be made from steam-stilled Prime City naphtha from Pennsylvania crude, which has the following proporties:

Gravity, deg. Baumé, 72 to 76.
Initial boiling point, deg. fahr., 110 to 122.
Final boiling point, deg. fahr., not over 270.

Petroleum ether should conform to the following specifications:

Gravity, deg. Baumé, 77 to 80 (the matter of gravity is unimportant).
Initial boiling point, deg. fahr., 110 to 120.
Final boiling point, deg. fahr., 220 to 245.
Unsaturated content not over 4 per cent by absorption in sulphuric acid (Bureau of Mines method).

The Saybolt distillation method applies to both of the above boiling-point ranges.

V. Emulsion Tests

In making emulsion tests the simple apparatus described below gives excellent check results.

The apparatus consists of a Coles milk shaker slightly altered to receive two 4-oz. oil sample bottles. The shaker is operated at a speed of 600 r.p.m., and has a 2-in. stroke.

About 1½ in. of oil and an equal quantity of distilled water is poured into the bottles, which are then corked and placed in the machine. These are shaken for half an hour, after which they are removed and allowed to stand at room temperature for 24 hours. The amount of unseparated oil is then determined and recorded as emulsion.

The above method applies only to oils having a viscosity not exceeding 50 sec. at 212 deg. fahr. When the viscosity exceeds this figure the oil should be blended with 50 per cent of standardized petroleum ether before shaking.

For the purpose of the specification the emulsion value of an oil can be considered as a quantitative test for "sulpho" compounds.

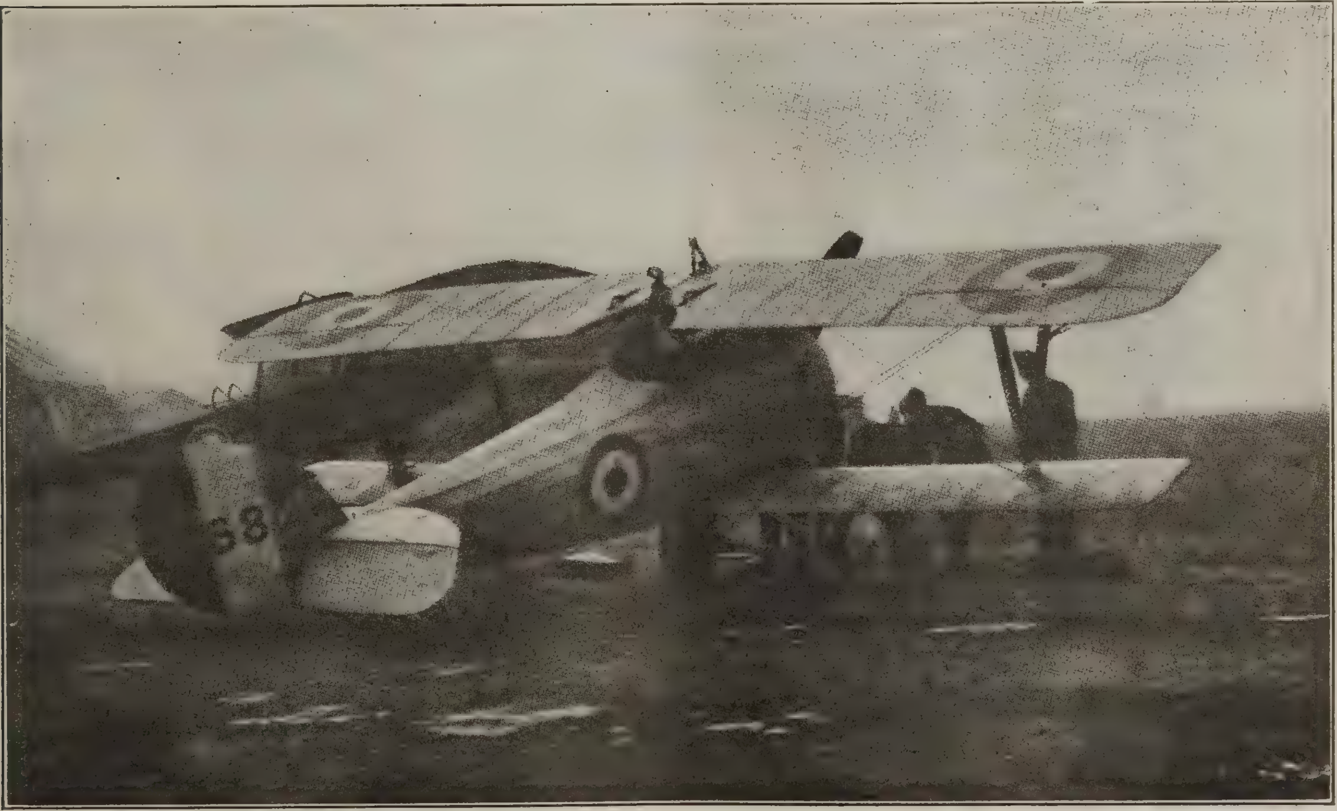
Author's Conclusion

These investigations were suggested by H. L. Horning, chairman of the Automotive Products Section, War Industries Board, Council of National Defense, who requested the author to make a thorough study of hydrocarbon lubricants for aircraft engines in the search for the best oil. The specifications as drawn above represent the results of these studies, which were begun in June, 1917, and terminated early last December.

In securing the data on which these specifications are based valuable assistance was received from a number of sources. The Tidewater Oil Company, Bayonne, N. J., permitted the author the use of its extensive laboratories for a number of months with the full collaboration of S. E. Campbell, chief chemist.

Credit should also be given Dr. C. E. Waters of the Bureau of Standards for information furnished regarding his oxidation oven and tests.

Dr. E. W. Dean of the Bureau of Mines made valuable suggestions relative to the distillation of hydrocarbons under high vacuum.



French pursuit machine being prepared for a flight over the enemy lines. (French official photo.)

AEROPLANE'S PARTS AT A GLANCE

THE long felt need for a simplified table to show at a glance the different parts of an aeroplane and give their technical nomenclature has been supplied by the issue of a pamphlet by the Aviation Department of the William Hood Dunwoody Industrial Institute.

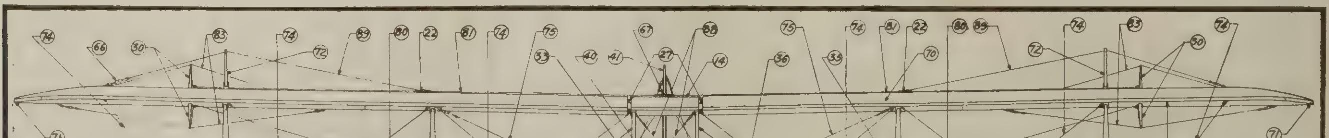
This pamphlet was prepared under the direction of Captain E. W. Farrow, formerly of the British Royal Flying Corps, who is in charge of the Aviation Department

It is an example of the thoroughness in which the patriotic members of the Aero Club of Minneapolis—which is responsible for the establishing of the Aviation Department at the Dunwoody Institute—does things.

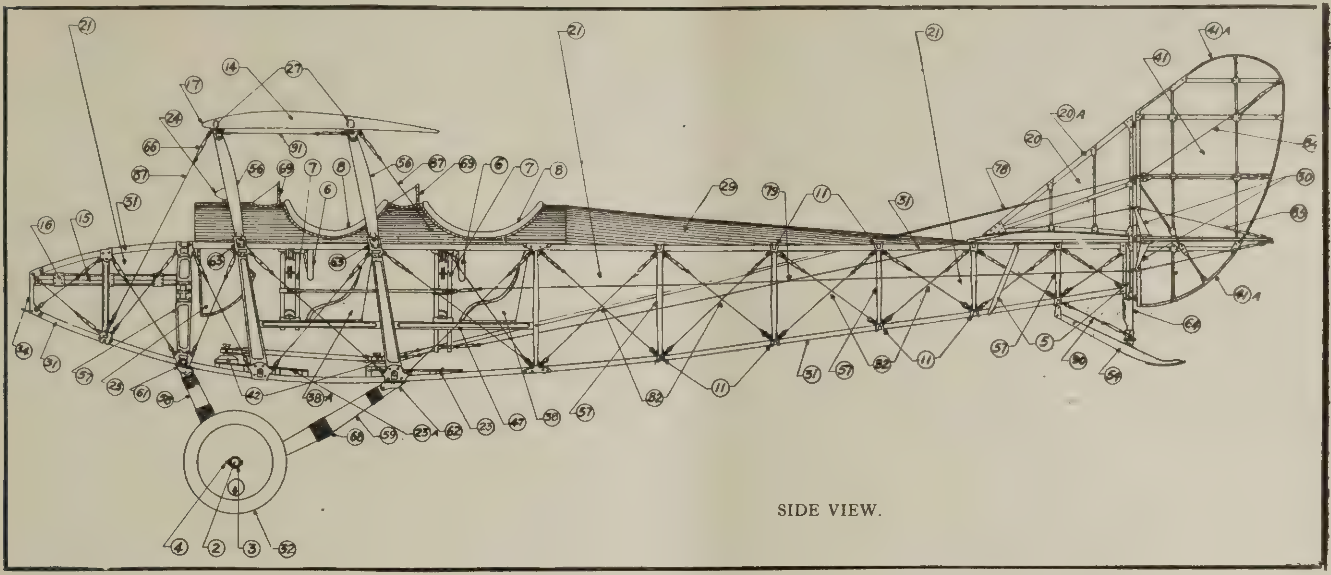
Every aviation student wants such information, and will be thankful to the Aero Club of Minneapolis, the Dunwoody Institute and Captain Farrow for it.

The nomenclature accompanying the diagrams follows:

T. 1. Aileron—A small wing usually situated at the outward end of the trailing edge, the operation of which turns an aeroplane about its longitudinal axis; causes an aeroplane to tilt sideways.
S. 2. Axle—Welded steel tubing with reinforced wood filler.
S. 3. Axle Collar—Machined brass, used to prevent wheels from coming off.
S. 4. Axle Collar Bolt—Hexagon head, passes through axle collar and axle, and is secured by castellated nut.
S.F. 5. Braces—Horizontal, stabilizer, steel tubing streamlined with spruce form, and covered with linen tape and dope.
S. 6. Control Wheel—Two in one, controls ailerons and elevators.
S. 7. Control Yoke—Non-magnetic aluminum tubing, fastened to seat rails by two trunions and bearings, and to which control wheels is secured.
S.T. 8. Cockpit—Pilot's, padded.
T. 9. Cowl—Top engine, sheet aluminum secured to side cowling by two straps and buckles.
F. 10. Cowl—Bottom, sheet aluminum.
F. 11. Clips—Fuselage, hold compression struts, fuselage diagonal bracing wires are also attaached.
T. 12. Distance Piece—A long, round piece of spruce running full length of wing and used to prevent ribs from rolling over.
T. 13. Elevator—A controlling surface usually hinged to the rear of the tail-plane the operation of which directs an aeroplane upwards or downwards.
S.T.F. 14. Engine Section Panel—Upper wings are attached to engine section panel.
S. 15. Engine Bed—Four laminations, two center spruce, outside hardwood, are used as engine supports.
S. 16. Engine Bed Protector—One thirty-second inch sheet steel wrapped around bed to prevent engine from sinking into wood.
S.T. 17. Edge Leading—The front edge of a surface relative to its normal direction of motion.
T. 17a. Edge Leading Form—Spruce.
T. 18. Edge Trailing—The rear edge of a surface relative to its normal direction of motion.
T. 18a. Edge Trailing Form—Flattened steel tubing.
T. 19. Fabric—Irish linen, shrunk and tightened by applying about six coats of dope and two of varnish.
T.S. 20. Fin, Vertical—A fixed vertical surface, used as a keel, and to prevent the machine from tail-spinning.
S. 20a. Fin, Vertical Form—Flattened steel tubing.
S.T. 21. Fuselage—The body of the aeroplane holding the motor, fuel, pilot, and passenger, and to which is fastened the panels and tail unit.
T. 22. Fair Lead—Used to prevent sway of control wires.
S. 23. Floor Board—Pilots, made of hard wood, used to attach rudder bar to.
S. 23a. Floor Board—Passenger.
S. 24. Gasoline Sight Gauge—Showing quantity of fuel in tank.
S. 25. Gasoline Tank—Heavy gauge tin.
F. 26. Gap—The distance between the upper and lower wings of a biplane.
F.S.T. 27. Hinges, Wing—Female on panels, male on engine section and connected by wing hinge pin.
T. 28. Hinges, Aileron—Male and female, used to connect aileron to panel by a hinge pin.
T.S. 29. Inspection Cover—An accessible streamline cover, fastened to upper longerons by four hinges on each side, can easily be removed to inspect control wires and fuselage bracing wires.
S.F. 30. King Posts or Control Posts—Used on controlling surfaces as a lever for control wires.
S. 31. Longeron—Generally white ash, running the full length of the fuselage and around which all the body of the machine is built up.
S.F. 32. Landing Wheels—Tangent wire wheel, pneumatic tires, spokes and rim covered by doped fabric to streamline wheels.
F.T. 33. Motor—Power-plant used to propel aeroplane.
S. 34. Nose-Plate—Shaped sheet steel, used to connect four longerons and holds radiator in place.
F. 35. Pitot-tube Head—The air passes through head and metal tubing to indicator which measures the velocity of an aircraft with reference to the air through which it is moving, usually calibrated in miles per hour.
F.T. 36. Propeller—Oak, mahogany, or walnut, five laminations so shaped that its rotation about an axis produces a force (thrust) in the direction of its axis. Includes both pusher and a tractor prop.
Panel or Plane—See wing.
F. 37. Propeller Hub—Machined steel, connects prop to crank shaft.
S.T. 38. Pilot's Seat—Upholstered bucket seat.
S. 38a. Passenger's Seat—Upholstered bucket seat.
T. 39. Pulley—Aileron compensating wire, ball-bearing pulley through which wire passes without friction.
F.T. 40. Radiator—Contains four and one-half gallons of water, used to cool motor.
S.F.T. 41. Rudder—A hinged or pivoted surface attached to the rear of tractor machine. Used to steer a course or direction.
S. 41a. Rudder Frame—Flattened steel tubing.
S. 42. Rudder Bar—Pilot's and passenger's, is dual control, ash bar, copper tipped, mounted in center on a swivel and each end connected to a control cable running to rudder.
T. 43. Rib, Compression—Acts as a lightened rib, besides bearing the stress of compression produced by the tension of internal bracing wires.
T. 44. Rib, Lightened—A curved wooden part assembled in a panel and used to give the panel its curvature and convey the lift from the fabric to the spare.
T. 45. Rib Nose—Same purpose as forty-four, but runs from leading edge form to front of main spar only.
T. 46. Rib, Nose Form—Three-ply wood, a curved form on top of forty-four, its purposes being to take fabric and keep it to its proper curvature and prevent its sagging.
S. 47. Seat Rail—Spruce I-beam running from station behind pilot's seat to station in front of passenger's seat, supports pilot's and passenger's seats, also see No. 7.
T. 48. Spar, Main—Spruce I-beam within a panel and to which all ribs, drift and anti-drift wires are attached.
T. 49. Spar, Rear—Same as forty-eight except situated in rear portion of panel.
T. 50. Spar, Tail Plane Main—Same purposes as forty-eight.
T. 51. Spar, Tail Plane Rear—For same purposes as fifty but of lighter construction, elevator is attached to it by hinges.
F. 52. Shock Absorber, Landing Gear—Two pieces of rubber ten feet long absorbs and minimizes the shock of a landing.
53. Shock Absorber, Tail Skid—Rubber, same as fifty-two, only situated at rear of machine.
S. 54. Skid, Tail—Made of white ash or other hardwood. Carries weight of rear portion of machine while on the ground, also acts as brake in landing.
F. 54a. Skid, Wings—Made of rattan. Protects and keeps wing tips from ground in case of bad landing.
F. 55. Struts, Wing—Made of spruce because it has a high compression strain for its weight. Used to keep upper and lower planes apart.
S.F. 56. Strut, Engine Section—Spruce, holds engine section panel to which upper planes are attached.
S. 57. Strut, Fuselage—Spruce, acts as spacer and keeps the four fuselage longerons apart.
S.F. 58. Strut, Landing Gear, Front—Spruce, reinforced by binding with linen twine.
S. 59. Strut, Landing Gear, Rear—Same as fifty-eight.
F. 60. Stream-Line Spacer—Used as a stream lining for axle, also acts as a spacer for wheels.
S. 61. Socket, Landing Gear, Front—Made of sheet steel, used to connect landing gear strut to fuselage.
S. 62. Socket, Landing Gear, Rear—Same as sixty-one.
S. 63. Socket, Engine Section Strut—Sheet steel, holds engine section strut, fuselage strut and diagonal bracing wires.
S. 64. Tail Post—White ash laminated, sometimes spruce. Vertical post finishing the streamline effect of the fuselage, and to which the four longerons are secured. The universal joint of tail skid and two hinges of rudder are also fastened.
T. 65. Tail Plane—A horizontal stabilizing surface attached by bolts to the rear portion of fuselage and to which the elevators are attached.
F.S. 66. Turnbuckle Fork—Consists of brass and alloy of man-



FRONT VIEW.



SIDE VIEW.

ganese barrel, fork with right hand thread always attached to fixed portion of machine and an eye with left hand thread which is attached to loop of cable or wire by splice. A turnbuckle is used to tighten or adjust cables or wires.

T. 67. **Turnbuckle, Eye**—Used to connect two wires, so two eyes are used instead of one fork.

F.S. 68. **Winding, Landing Gear Strut**—Bound with linen twine to reinforce and prevent splintering.

S. 69. **Wind Screen**—Made of celluloid with aluminum frame, used to deflect wind and oil from passenger or pilot.

F.T. 70. **Wing**—The supporting surfaces of an aeroplane.

F.T. 71. **Wing Tip**—The extreme right or left hand end of a wing.

F.T. 72. **Wing Masts**—Spruce with copper banding at each end, used as a truss for cable which supports upper wing extensions when machine is on the ground.

F. 73. **Wires, Landing**—Stranded steel cable, used to take load of wings when machine is landing or on the ground, also used for adjusting dihedral angle of machine.

F. 74. **Wires, Flying**—Duplicated stranded steel cable, used to take load of machine while flying; these wires prevent wings from folding upwards when flying.

F.T. 75. **Wires, Drift**—Stranded steel cable, used to prevent wings from folding backwards when flying.

T. 76. **Wires, Anti-Drift**—Piano wire, diagonal bracing wires used to adjust wing framework and to hold rigid.

T. 77. **Wire, Drift (Wing)**—Piano wire, same purposes as seventy-six.

S.T. 78. **Wire, Rudder Control**—Flexible stranded steel cable, used to connect rudder-bar to king-posts of rudder.

S.T. 79. **Wire, Elevator Control**—Flexible stranded steel cable, used to connect control yoke to king-posts of elevators.

F. 80. **Wire, Aileron Control**—Flexible stranded steel cable, used to connect control wheel to aileron king-posts.

T.F. 81. **Wire, Aileron Compensating**—Flexible stranded steel cable, used to balance and adjust ailerons.

S. 82. **Wire, Fuselage, Diagonal Bracing**—Forward half of fuselage are duplicated stranded steel cables, rear half are piano wires.

F.T. 83. **Wire, Aileron Control Bracing**—Piano wire, used to brace king-posts, and to prevent warping of ailerons.

S.T. 84. **Wire, Rudder Control Bracing**—Piano wire, same function as eighty-three.,

F.T.S. 85. **Wire, Elevator Control Bracing**—Same function as eighty-three.

F. 86. **Wire, Landing Gear Diagonal Bracing**—Heavy stranded steel cable, used to hold landing gear rigid and to take strains in landing.

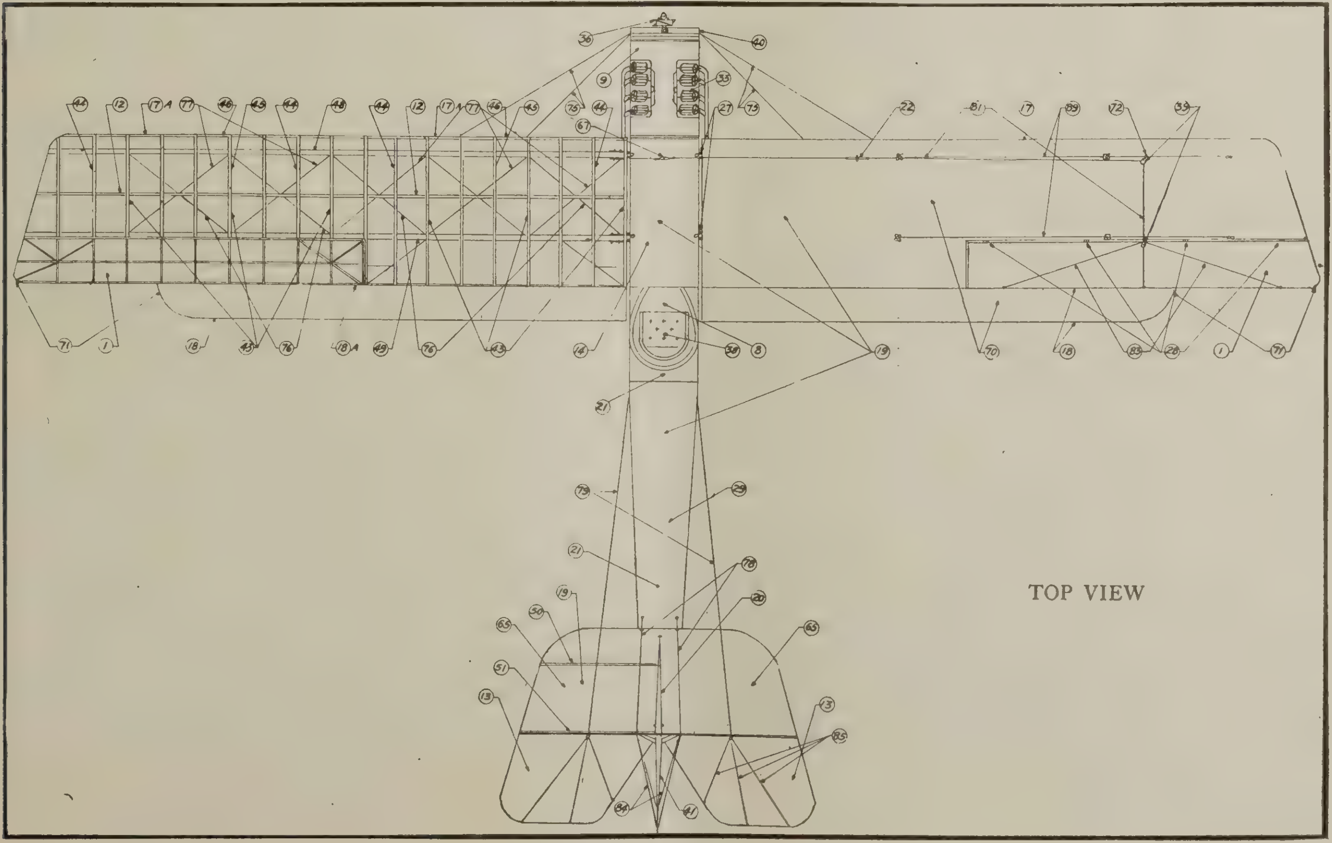
S. 87. **Wire Engine Section Bracing**—Heavy stranded steel cable used to adjust stagged on engine section.

F. 88. **Wire, Engine Section Diagonal Bracing**—Heavy stranded steel cable, used to hold engine section rigid and take strain of machine both when on the ground and flying.

F.T. 89. **Wire, Overhang**—Stranded steel cable, runs over wing mast and takes load of extension when machine is on ground.

S. 90. **Wire, Tail Post Bracing**—Piano wire, used to brace tail post and take strain from tail posts in a fast landing.

S. 91. **Wire, Engine Section Tie**—Stranded steel cable, used to connect engine section struts from spreading.



TOP VIEW

THE "CROCCO" ROUTE INDICATOR AND ITS NOTEWORTHY APPLICATIONS*

THE preponderance of the study of statics and of dynamics of aircraft has for a long time caused the study of the methods of navigation to pass into a secondary place, although these are of very great importance for all practical purposes. From the evident similarity between aerial and maritime navigation, it can easily be believed that the same methods which have reached the highest state of perfection in maritime navigation may be applied to aerial navigation; but it should be remembered that the space in which an aeroplane moves generally possesses a motion with velocity of the same intensity as the velocity of the aeroplane, and it may be understood at once that the case of navigation in the air is essentially different in this respect to that of navigation in the sea where the currents usually have a very low velocity.

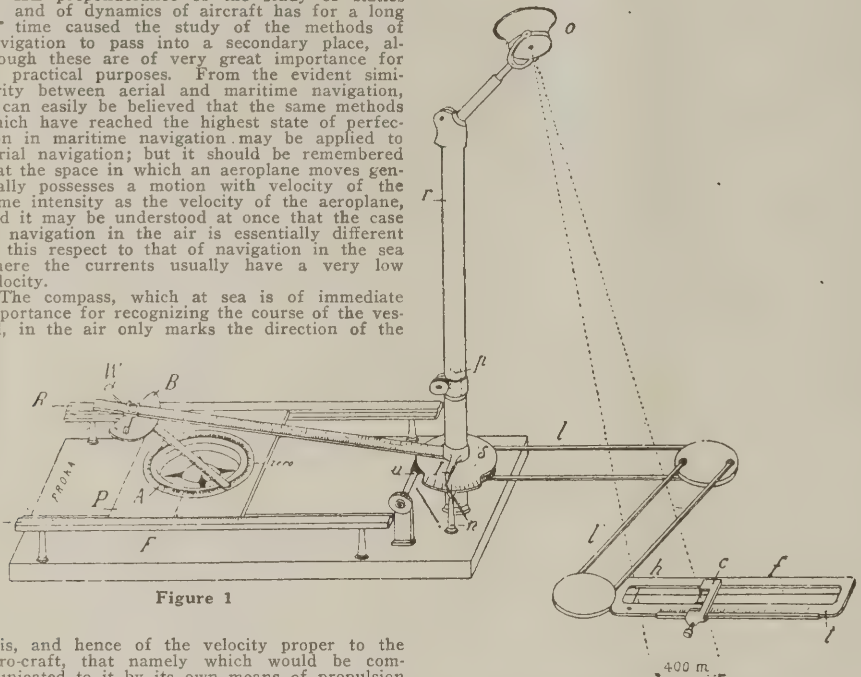


Figure 1

The compass, which at sea is of immediate importance for recognizing the course of the vessel, in the air only marks the direction of the axis, and hence of the velocity proper to the aero-craft, that namely which would be communicated to it by its own means of propulsion in completely calm air. The real velocity with regard to the ground, which is that which is of interest for navigation, as it is the resultant of the velocity of the aeroplane and of the velocity of the wind, has in general a direction very different to that which is indicated by the compass, which, therefore, by itself cannot give the pilot an exact measurement of the orientation of his course. The pilot, however, may count on the compass to guide him, if he have at his disposition a route indicator, which allows him either to pass from the indication of the compass to the real course or to deduce from the orientation of the determined route the compass indication which has to be followed by the pilot.

Notwithstanding the importance of the two above-mentioned problems, it is difficult to find among the large production of books on aeronautics an adequate note on them and a solution which would be of use rapidly in practical cases.

When I previously† considered this question I proposed a very simple instrument for the determination of the necessary elements for the correction of the route by the deviation due to the wind (drift angle, effective velocity), which at the experiments which I carried out gave sufficiently satisfactory results. For their description I refer my readers to the last of the above-mentioned notes: my aim is to examine here an instrument for route indicating invented by Lt.-Col. Crocco, which presents the possibility, in addition to solving the above-mentioned questions in every detail during the flight, of solving many other problems belonging to navigation and to gunnery, and which therefore are of the greatest interest; I will then touch upon some of its notable applications.

Fig. 1 represents diagrammatically the apparatus of which a photograph is produced herewith; we shall distinguish two parts in it: one destined for the solution of the first of the above-mentioned problems—namely, to recognize the orientation of the actual effective motion of the aeroplane, which in general, as I have already pointed out, differs from the correct indication of the compass, by a certain angle called drift angle, the other which more properly deserves the name of route indicator, destined to solve the second problem—namely, to get the indication for the use of the pilot to be able to follow a given route. In general such indication differs from the direction of the fixed route by a certain angle which is called "angle of pilotage."

The first part of the apparatus consists in a pointing instrument which allows the determination of the orientation of the apparent motion of the points of the ground over which the aeroplane is flying; this is equivalent to determining the direction of effective motion, since evidently the points of the ground seem to the person who is on the aeroplane to remain behind in the same direction along which the aeroplane really moves, and the velocity with which they seem animated is equal to the real velocity of the aeroplane.

On the pivot *ρ*, which is solidly fixed on board the aeromotor, let a coupling box *m* be fixed; this is movable round the pivot by means of a micrometric screw *u* and is furnished with a graduated sector *δ*; by this means we can measure the angle by which it is revolved with respect to a pointer *n* fixed at the base of the apparatus. Two pivots are fixed on to this coupling box round which the two equal sides of the articulated parallelogram *l* turn, which, by means of a second articulated parallelogram *ν* sustains the aim or sight-vane *t*.

This consists of a rectangular plate, crossed in its greatest length by a groove through the middle of which a wire *f* is stretched. Along the sight-vane a slider *c* is movable, and on the edge of the sight-vane a graduation is engraved calculated in such a way that it allows, when the height of the aeroplane is known, by limiting a length of wire between the slider and the fixed extremity *h* that when seen through the sight *o* it covers over the ground a length of 400 meters; and this is done by simply bringing the slider on to the level of the graduation marked with the aforesaid height.

The screw *u* allows any orientation whatever to the wire itself, and it is clear that when the screw is fixed the articulated parallelograms allow the sight-vane to be moved in its own place, so that the wire always remains equally oriented. The apparatus is mounted on board in such a

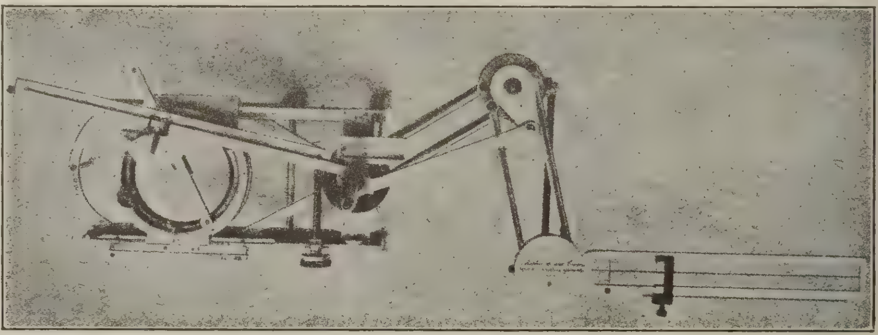


Fig. 1a—Crocco route indicator seen from above

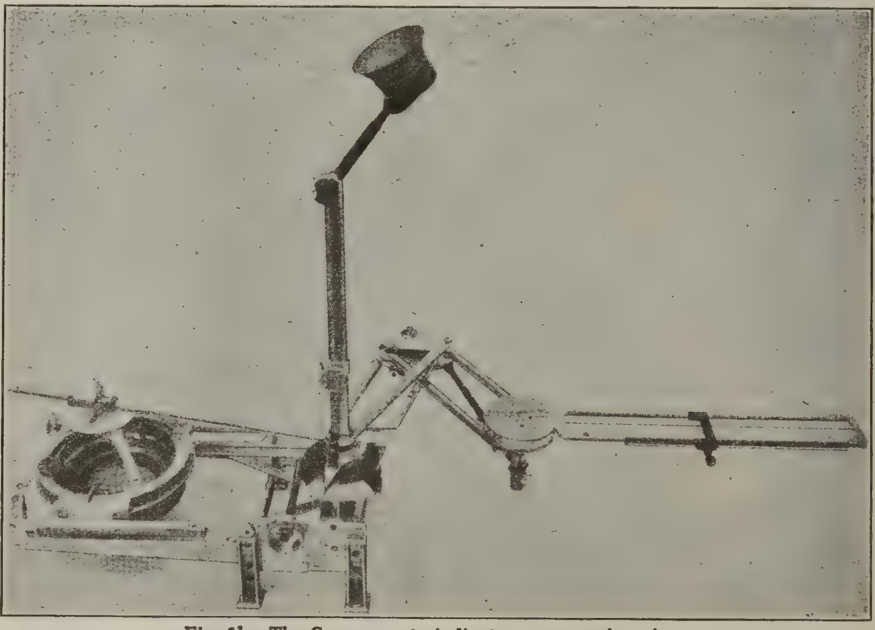


Fig. 1b—The Crocco route indicator: perspective view

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*Courtesy, *Rivista Tecnica d'Aeronautica* and London *Aeronautics*.

†M. Tenani, "Instruments and Methods of Aerial Navigation," in *Rivista Italiana d'Aeronautica*, Rome, February, 1917, and the notes of A. lithographed by the Government Aerological Station P. of Vigna di Valle, entitled "Measurements of the Velocity of the Wind and of the Pilotage Angle during Flight, and on the Correction of the Route from Deviation due to the Wind" (March, 1917).

way that when the zero of the graduation of the sector δ opposite the fixed pointer *n*, the wire becomes parallel to the axis of the aeroplane—namely, to the direction of the velocity proper of the aeroplane. Now let us choose any point whatever on the ground and let us move the sight-vane in such a way that looking from *o* the point *h* may be found in correspondence with the observed point.

If as time passes the point observed seems to slide along the wire of the sight-vane, that will mean that the wire will have the direction of the motion of the points on the ground; that is, according to what has been said above, it will have the orientation of the effective motion. If this does not happen, by turning the micrometric screw it will be easy to give suitable orientation to the sight-vane, and after a few experiments, when the sight-vane is well adjusted in the aforesaid way, we shall be able to read on the sector δ, through what angle it should be turned, with regard to its zero position—namely, by how many degrees the orientation of the real motion differs from the orientation of the proper motion of the aeroplane (drift angle). For this reason the sector δ is called the *drift sector*.

Let us count by means of a chronometer how many seconds pass between the moment in which a point on the ground is in correspondence with the fixed point *h* and the moment in which it is seen in correspondence with the slider; this will be the time taken from the point in its apparent motion, or of the aeroplane in its real motion to travel 400 meters. Hence the effective velocity is at once deduced in meters per second at which the aeroplane moves with respect to the ground, dividing 400 meters by the number of seconds employed for taking the measures, but, as we shall see, it is not even necessary to make this division, because on one of the sides of the apparatus, which we will describe later, we have a double scale, in seconds and in meters, which gives the result of the division facing the numbers of seconds.

As we have seen, the part of the apparatus which we have described allows us to deduce, by the proper orientation, the real orientation of the motion; and that orientation adding to or subtracting from its proper orientation (counting from the north in degrees in the direction of the hands of a watch, as is supplied by the compass when corrected for magnetic declination, and for deviation due to the iron existing on board) the drift angle, according as it is righthand (that is, the effective motion is moved to the right of the axis) or left; and allows the real velocity of the motion to be determined.

Let us note further that the apparatus presents the possibility of plotting out the passage of the points on the ground in another way—namely, by fixing the sight-vane directly to the coupling box and rendering the sight *o* movable in a horizontal plane by means of suitable articulations, supported by the pivot ρ.

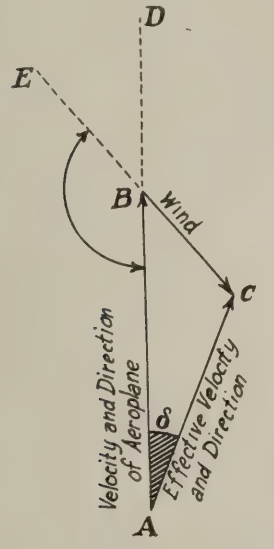

D
E
B
Wind
C
Velocity and Direction of Aeroplane
δ
Effective Velocity and Direction
A

Figure 2

It is easily understood how the apparatus itself may be used when it is wished to determine the direction and the velocity relative of the aeroplane, with respect to a movable point on the ground, when it may be supposed that this moves with uniform velocity and in a straight line (for instance, trains, motor-cars, ships) for artillery targets.

Let us now see how we may by means of the other parts of the instrument solve the second problem we have mentioned—namely, the finding of the compass indication, which will enable the pilot to follow effectually a fixed route. The following consideration will be useful to us. Let us draw a triangle as shown in Fig. 2, in which AB represents the proper velocity to the aeroplane in size and direction AC represents the effective velocity in size and direction; the included angle will be the drift angle (in the figure, drift on the right). The third side BC of the triangle will evidently represent the velocity and the direction of the wind which, combined with the proper velocity, gives us the resultant effective velocity. It is clear that the angle ABE (equal to its opposed angle DBC, which is the angle included between the axis of the fuselage and the direction of the wind, and which is called for this reason "head wind" angle) counted in the direction of the hands of a watch from the side AB to the side EB represents the angle through which it is necessary to turn (in the same sense) the proper direction so as to get the direction in which the wind proceeds. So that, knowing the head wind angle, it is sufficient to add it to the proper orientation indicated by the compass in order to obtain the orientation of the wind velocity.

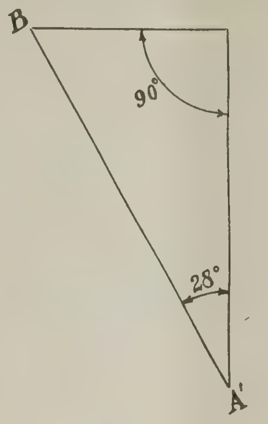


Figure 3

Let us observe in the meantime that the velocity and direction of the wind, obtained in this way, does not vary rapidly in the time (as the soundings by pilot balloons show at least at heights exceeding 500 meters from the ground); so that we may consider the direction and the velocity of the wind as constant within sufficiently ample limits of time. Let us observe then that if the route is marked on the map in degrees from the north, the pilot will be certain of passing over it when the angle always counted in the same direction, included between the effective velocity and the direction of the wind ("wind-velocity effective angle") shall be equal to the angle, which may be easily calculated, included between the fixed route and the direction of the wind ("wind-route" angle). Now the effective wind velocity angle is the angle ACB of our triangle; therefore, if this angle be different from the "wind-route" angle, and hence the fixed route is not followed, we may construct another triangle A′B′C′ which has for sides the velocity of the aeroplane on the ground and let us move the sight-vane in such a way that looking from *o* the point *h* may be found in correspondence with the observed point.

If as time passes the point observed seems to slide along the wire of the sight-vane, that will mean that the wire will have the direction of the motion of the points on the ground, that is according to what has been said above, it will have the orientation of the effective motion. If this does not happen, by turning the micrometric screw, it will be easy to give suitable orientation to the sight-vane, and after a few experiments, when the sight-vane is well adjusted in the aforesaid way, we shall be able to read on the sector δ, through what angle it should be turned, with regard to its zero position—namely, by how many degrees the orientation of the real motion differs from the orientation of the proper motion of the aeroplane (drift angle). For this reason the sector is called the *drift sector*

Let us count by means of a chronometer how many seconds pass between the moment in which a point on the ground is in correspondence with the fixed point *h* and the moment in which it is seen in correspondence with the slider; this will be the time taken from the point in its apparent motion, or of the aeroplane in its real motion to travel 400 metres. Hence the effective velocity is at once deduced in metres per second at which the aeroplane moves with respect to the ground, dividing 400 metres by the number of seconds employed for taking the measures, but, as we shall see, it is not even necessary to make this division, because on one of the sides of the apparatus, which we will describe later, we have a double scale, in seconds and in metres, which gives the result of the division facing the numbers of seconds.

As we have seen, the part of the apparatus which we have described allows us to deduce, by the proper orientation, the real orientation of the motion; and that orientation adding to or subtracting from its proper orientation (counting from the north in degrees in the direction of the hands of a watch, as is supplied by the compass when corrected for magnetic declination, and for deviation due to the iron existing on board) the drift angle, according as it is righthand (that is the effective motion is moved to the right of the axis) or left; and allows the real velocity of the motion to be determined.

Let us note further that the apparatus presents the possibility of plotting out the passage of the points on the ground in another way—namely, by fixing the sight-vane directly to the coupling box and rendering the sight *o* movable in a horizontal plane by means of suitable articulations, supported by the pivot ρ.

It is easily understood how the apparatus itself may be used when it is wished to determine the direction and the velocity relative of the aeroplane, with respect to a movable point on the ground, when it may be supposed that this moves with uniform velocity and in a straight line (for instance, trains, motor-cars, ships) for artillery targets.

Let us now see how we may, by means of the other parts of the instrument, solve the second problem we have mentioned—namely, the finding of the compass indication, which will enable the pilot to follow effectually a fixed route. The following consideration will be useful to us. Let us draw a triangle as shown in Fig. 2, in which AB represents the proper velocity to the aeroplane in size and direction; the included angle will be the drift angle (in the figure, drift on the right). The third side, BC, of the triangle will evidently represent the velocity and the direction of the wind which, combined with the proper velocity, gives us the resultant effective **velocity.** It is clear that the angle ABE (equal to its opposed angle DBC, which is the angle included between the axis of the fuselage and the direction of the wind, and which is called for this reason "head wind" angle) counted in the direction of the hands of a watch from the side AB to the side EB represents the angle through which it is necessary to turn (in the same sense) the proper direction so as to get the direction in which the wind proceeds. So that, knowing the head wind angle, it is sufficient to add it to the proper orientation indicated by the compass in order to obtain the orientation of the wind velocity.

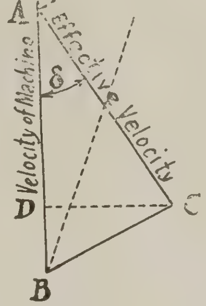


Figure 4

Let us observe in the meantime that the velocity and direction of the wind, obtained in this way, does not vary rapidly in the time (as the soundings by pilot balloons show at least at heights exceeding 500 metres from the ground); so that we may consider the direction and the velocity of the wind as constant within sufficiently ample limits of time. Let us observe, then, that if the route is marked on the map in degrees from the north, the pilot will be certain of passing over it when the angle always counted in the same direction, included between the effective velocity and the direction of the wind ("wind-velocity effective angle") shall be equal to the angle, which may be easily calculated, included between the fixed route and the direction of the wind ("wind-route" angle). Now, the effective wind velocity angle is the angle ACB of our triangle; therefore, if this angle be different from the "wind-route" angle, and hence the fixed route is not followed, we may construct another triangle, A′ B′ C′, which has for sides the velocity of the aeroplane and the velocity of the wind found, and for angle A′ C′ B′ the "wind-route" angle; in this the third side will represent to us the effective velocity with which the aeroplane will cross the fixed route, and the angle at A will represent the angle by which the proper orientation must differ from the orientation of the route (pilotage angle).

Fig. 3 here given represents the triangle A′ B′ C′ for a wind route angle of 90°, the proper velocity and for the wind velocity being the same as before. The angle B′ A′ C′ here becomes 28°—namely, in such a case the direction of the fuselage must differ by 28° from that of the route.

After this let us proceed to examine the second part of the apparatus, which is used to solve the aforementioned problem and which may be considered as an articulated triangle by which the aforementioned triangles may be mechanically produced.

On the base of the apparatus a ruler V is mounted for the purpose of measuring in centimetres the distance from the axis of the pivot ρ to the centre of a platform P that may be slid by the hand along the ruler itself. This ruler is by its construction parallel to the axis of the aeroplane when the apparatus is fixed on board in the way described above; namely, parallel to the direction of flight.

On this we shall calculate the proper velocity of the aeroplane representing metres by centimetres.

However, fixing the platform in such a way that its line of collimation F points, for instance, on the graduation 20, this will signify that its centre is 20 centimetres distant from the axis of the pivot ρ, and so we may say to have calculated the proper velocity of the aeroplane as being 20 metres per second. Round the centre of the platform let a ruler W be movable, and, by an appropriate circular graduation inscribed upon it, we shall be able to read for every position of the ruler W the angle which it forms with the direction of the proper velocity.

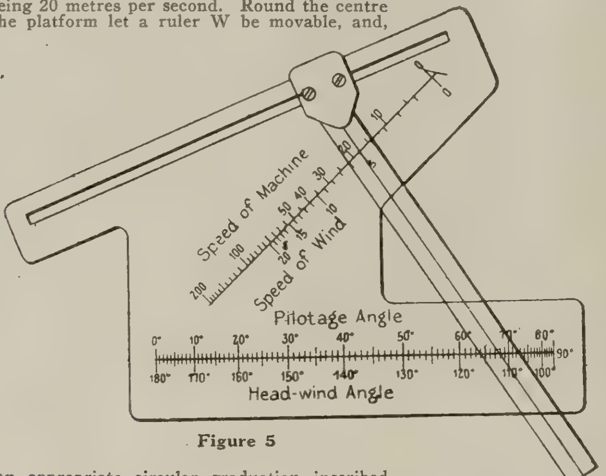


Figure 5

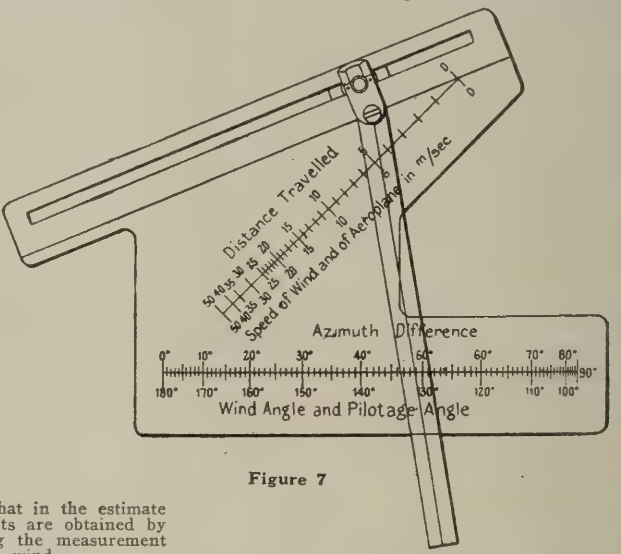


Figure 7

This ruler W also is graduated in centimetres and is provided with a movable hand-slide, opposite to whose collimation line we may read the distance included between the centre of the platform and a certain point B of the slide; another slide is pivoted at this poit, which is again fixed in a third graduated ruler, which can now be described. At the intersection B of the ruler W and the third ruler, a graduated sector is inserted ("crossing sector"), which allows us to know the angle included between the ruler W and the third ruler.

The third ruler revolves round the pivot ρ, and its position shows us the angle which it forms with the straight line which joins the centre of the platform with the pivot ρ—namely, with the direction of the proper velocity by means of a pointer I movable with it and which revolves on the drift sector. This ruler bears two graduations—one in seconds, the other in centimetres, and is the one referred to before which allows us to read, facing the number of seconds used for the measure of effective velocity, the same velocity expressed in metres per second. Therefore, let us call this ruler the *effective velocity ruler.*

It is convenient that at the beginning of every reading, as we shall now show, the ruler W and that of the effective velocity should be placed one over the other. After that let us suppose that we have made a drift measurement as mentioned above; let us place the slide of the ruler of effective velocity on the number of seconds taken for the measurement; we shall get on the ruler itself the segment which represents the actual effective velocity. Let us move the platform so as to reckon the velocity of the aeroplane which we may consider as known, and, always holding the side firm on the effective velocity which was found before, moving it in the opposite direction in such a way that it assumes the orientation of the effective motion—namely, that pointer I is opposite to O of the drift sector; evidently, calling to mind the triangle A′ B′ C′ which we have already mentioned, the ruler will show the direction of the wind, and on its graduation we shall be able to read its velocity. For this reason the ruler W is called the wind ruler. The angle which is read on the graduation of the platform is the head-wind angle, and the angle on the sector at the point of crossing is the wind-velocity effective angle.

As has been said, adding the proper direction to the head-wind angle which has been found, we shall have the direction of the wind velocity. Comparing this direction with the fixed route, we shall get as a difference the "wind-route" angle. Then, turning the wind slide round, but keeping its length unchanged, we may reproduce this wind-route" angle on the sector at the point of crossing. And then, as has been said on Fig. 5, the angle included between the sides of the effective and of the proper velocity (which will be read by means of the pointer on the drift sector put with o opposite the fixed pointer η) will be the angle of pilotage. On the effective velocity ruler we may read the value of such a velocity for the fixed route. By adding or subtracting this angle of pilotage from the direction of the route (according as we read to the right or to the left of the zero of the drift sector) we shall obtain the true direction to be given to the axis of the aeroplane in order to follow the fixed route. From which, taking into account in the usual manner the declination of the compass and the new deviation of the compass, we shall have at once the angle to be given to the pilot.

The detailed examination that I have carried out of the errors which may influence the measurements exposed above shows that the relative error in the measurement of the effective velocity is equal to that in the estimate of the height; the best results are obtained by guiding the aeroplane during the measurement almost perpendicularly to the wind.

All these operations are facilitated by the use of a special plate, on which the above-mentioned operations are indicated, and they become in this way purely mechanical. The apparatus can completely solve the problems pointed out by us in a very simple way. Among the many applications to which the apparatus itself may give rise, I will mention here the following very important one, either for approval tests of aeroplanes or in the case of where the aeroplane's proper velocity is not known and its measurement is needed.

It will be useful to start from the following consideration (Fig. 4). Let us imagine that we know the proper velocity of the aeroplane, and that we have measured its effective velocity and the drift angle, and let us construct the usual triangle $A\ B\ C$. Let us then steer the machine in such a way as to get its proper direction different by 180° from the preceding one, and let us construct the usual triangle $A\ B\ C$ with the new elements. Let us then bring the "proper velocity" sides of the two triangles to coincide, as shown in Fig. 4. By constructing the projections $A\ D$ and $B\ E$ of the effective velocities on the direction of the proper velocity in both cases we shall obtain:

$A\ D$ = proper velocity less the wind propection

$B\ E$ = proper velocity plus the wind projection

Hence $\frac{A\ D + B\ E}{2}$ (Average of the two projections) = proper velocity.

If now, returning to the route indicator, we measure the effective velocity in the above-mentioned two cases, and we construct the projections of such effective velocities along their proper direction (by disposing and fixing the wind side in such a way that it is perpendicular to the side of the proper velocity and then moving the platform in such a way that the ruler of the effective velocity assumes the direction which is due to it, and the effective velocity measured is read on it), the average of such projections will be the proper velocity which was sought.

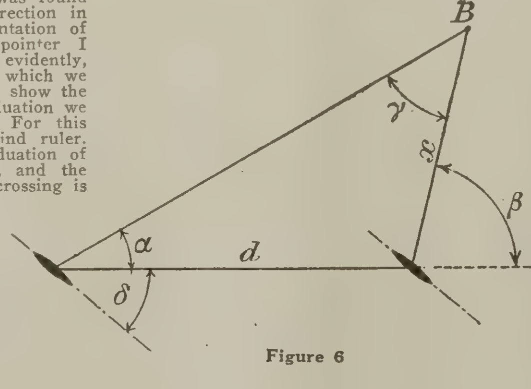


Figure 6

As will be easily understood from what we have before said, it is necessary that during the measurements here described, which will take a very short time, the aeroplane must be kept at a constant height in an unaltered direction by the compass.

The route indicator described above may therefore altogether substitute and complete all instruments in existence up to the present time. We will here refer to the ingenious nomogram constructed by the Goerz firm, which is to be used for rapidly finding out the pilotage angle when the proper velocity, the wind velocity, and the "route wind" (angle measured this time from 6° to 180° to right or to left) are known. Fig. 5 represents instrument in the position of the slide *C*, which makes a wind velocity of 5 metres and a route angle of 68° correspond under the pointer *I*. Leaving the slide fixed, and moving the pointer in such a way that it will pass through the division which represents the proper velocity of the machine (for instance, 60 kilometres an hour) we should obtain on the lower scale the angle of pilotage (about 16°). In reality, however, the Goerz nomogram is of no use, because none of the elements necessary for its use are known *à priori.*

I have, however, effected a slight modification to the apparatus which has allowed me to carry out the following important application of the "Crocco" indicator, measuring the distance of a point on the ground from the vertical line of the aeroplane. The usual pointing instruments solve such a problem only for short distances. Let us suppose that we measure with a sight-vane (for instance, that of the compass) the angle that the eye directed towards the aim *B* forms with the axis of the aeroplane. Adding or subtracting from this the drift angle δ, according as this is on the same side of the point or on the opposite side, we shall have the angle α of the visual with the effective direction of the motion. After a moment we will make a second determination of the above-mentioned angle. The angle β of the figure will be measured. Now, the angle *B* of the triangle formed by the two visual lines and by the route is evidently—

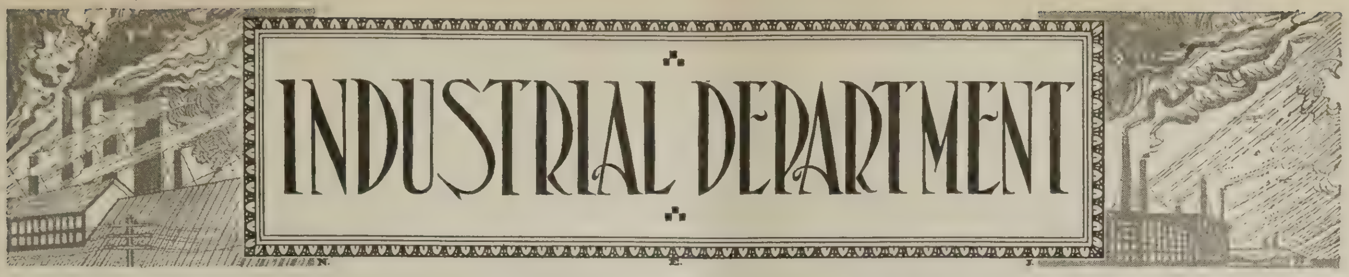
$$\gamma = \beta = \alpha$$

and, calling d the distance passed over by the aeroplane between the first and second determination (which may be immediately calculated when the effective velocity be measured with the indicator), we shall see that the unknown distance x from the second position at the aim should be, as Fig. 6 demonstrates:

$$x = d\frac{\sin\alpha}{\sin(\beta - x)}$$

If modifying as in Fig. 6 the nomogram Goerz we make the transparent pointer I pass through the graduation marked with the distance d and through the angle α, written in the lower scale, and, leaving the slide fixed, we then make the line of the pointer pass through the angle $(\beta - x)$, the difference of the two azimuth readings on the sight-vane, we shall immediately have on the higher scale the distance sought.

The importance of the considerations worked out and of the measurements and applications described will certainly not escape anyone who has any familiarity with the problems of navigation, and particularly the importance of knowing a few minutes before firing the drift, the velocity, and the effective direction of the aeroplane.



INDUSTRIAL DEPARTMENT

PHILADELPHIA IN THE AERONAUTIC INDUSTRY

By W. R. D. HALL

Secretary of the Philadelphia Chamber of Commerce

IN the city where Benjamin Franklin conducted his remarkable series of electrical experiments, laying the foundation for the series of discoveries which have made America the leader of all nations in that line, there has been developed a center of industry having to do with the supremacy of the air. Because of the fact that the United States Navy has one of its principal yards located within the corporate limits of the City of Philadelphia, and because of the further fact that almost within a stone's throw of this navy yard there is an aviation field started at first by a group of enthusiastic young aeronauts and maintained by them as a flying training ground until taken over by the Government, it was entirely within reason that the Secretary of the Navy should select League Island as the location for the Naval Aeronautic laboratory.

This laboratory, about which little has been said as yet because of the necessity for secrecy under the censorship provisions, will be formally dedicated by the Secretary of the Navy on its completion and undoubtedly will be developed into the leading place of its kind in the United States.

Geographically and topographically Philadelphia offers remarkable inducements for the development of aeronautic industry. The city lies on the border line on the coastal plain and the Piedmont Uplands. Northward the Delaware River is navigable for a considerable distance above the city, and southward it extends in increasing widths to the sea. West of the city are the rolling Piedmont Uplands. To the eastward southern New Jersey offers vast level stretches over which flying conditions are ideal.

Long before the development of the present day types of aeroplanes, Philadelphia was the center for experiments in aeronautics with balloons along the Atlantic Seaboard. The ideal commercial location of Philadelphia. "The World's Greatest Workshop," makes it particularly appropriate as a place for future development along aeronautic lines, with the Government Station at League Island and with the development which is bound to come from the increased facilities which will be afforded civilian aeronauts. When peace is restored, Philadelphia will have distinct advantages to offer the manufacturer of aeronautic supplies and accessories within her boundaries.

AERO MAKING IN DETROIT

The Beginnings of an Important Industry

By A. A. TEMPLETON

President, Detroit Board of Commerce

ONE of the principal events of the Detroit Board of Commerce cruise in 1916 was an address by Rear-Admiral Robert E. Peary on the aeroplane as a machine of defense in time of war. He spoke of the "command of the air" as a matter of prime importance in any contest, and emphasized the pitiful lack of this country in that respect. We had then in the army and navy, together, 100 aeroplanes. Little Bulgaria, with an area less than that of the State of Maine, had 300; and in Germany, England and France they were counted by the thousands. He insisted that in view of possible future contingencies, this country should have at least 5,000 planes on each coast, and nearly an equal number on the northern frontier.

The Admiral was considered by some of his hearers as an alarmist, but his address made a deep impression on others, and may be said to have marked the beginning of serious thought on the possibilities of Detroit as an agent of preparedness in this line of service.

There was every reason to believe that this city might attain the same prominence in the making of aeroplanes that it did in the automobile industry. It had a larger force of gas-engine workers than any other city in the country. It had a host of skilled brass, steel, aluminum and wood workers. Its manufacturers had abundant capital, and they had already shown a great readiness in adapting their plants to new conditions. A number of young men had taken up the air flight as a pastime, and they began to seriously consider the possibilities of the aeroplane as a business.

The most important contribution of this city to the industry has been the development of a suitable motor for the plane. One of the persons interested was Mr. Henry B. Joy, president of the Packard Motor Car Company, and the most expert engine workers in that plant were assigned to the work of developing a motor that should have the best possible combination of lightness, strength and speed. Three months of experimentation produced a motor which is still in wide use. Mr. Joy also made another important contribution to the service in turning over to the Government a large tract of land well adapted to aeroplane instruction and training. This tract is famous as the Selfridge Field near Mt. Clemens. The Packard Company is still doing important work in the manufacture of its serviceable motors.

With the entry of the United States into the war there came an insistent demand for aeroplane construction on an even larger scale than Admiral Peary had advocated, and speed as well as volume of work were essential. In the emergency Messrs. Henry M. and Wilfred C. Leland, who had built up the Cadillac motor car industry left their company and incorporated with others as the Lincoln Motor Company. With a speed that was almost magical they built a factory nearly quarter of a mile long, and made arrangements with the Government for the manufacture of the Liberty Motor which has been perfected through the agency of experts from all parts of the country. Within a few months of the inception of this enterprise these motors were turned out in quantity and are the standard motor now in Government construction for overseas service.

There is no plant in the city at present nor any immediate prospect of one for assembling planes. Curtiss Brothers have a small plant for making some of the parts. The Ford Co. are making a motor that is in use for planes in this country, and a large contract has been placed with an auto body company for the wooden parts for frames. Aside from the Liberty Motors, however, aero constrduction has not yet taken place among Detroit's greatest industries.

The direct exports of aeroplane parts from this port commenced in June last and has been continued, though in small volume ever since. They all go to Canada, where the work of assembling planes is far in advance of that in this country.

(Continued on page 62)

FOREIGN NEWS

FRANCE

The French official announcement of March 6th reports the destruction of five enemy machines, as follows:

"On Tuesday three German aeroplanes were brought down by our pilots and two by the fire of our anti-aircraft guns."

Thirteen tons of bombs and successful combats were announced on March 7th:

"On March 6th four German aeroplanes were brought down by our aviators. Our bombarding squadrons dropped 12,000 kilograms (more than thirteen tons) of explosives on railway stations and munitions depots in the enemy zone."

"Allied aviators bombed enemy depots west of Petric and the railway station at Pardovica, in the Vardar Valley," according to the announcement on the Balkan operations issued on March 3d.

Rumors again reach us that Captain Georges Guynemer, the renowned French fighting aviator, who has a record of destroying fifty-four German machines, is not dead but is a prisoner in Germany. It is reported that the entire squadron (Les Cigognes), to which Guynemer was attached, shares the belief that Guynemer was not killed, but captured. The report most recently received is that Guynemer is in a hospital in a German fortress near the Russian lines. Several captured enemy aviators, though not stating positively, assert that it is generally believed that Captain Guynemer is a prisoner in Germany. The enemy has never issued a statement on the subject, and when last seen, Guynemer was not reported in battle with German airmen.

GERMANY

Very successful work on the part of German aviators is indicated in the official announcement of March 7th, which follows:

"Nineteen enemy aeroplanes and two captive balloons were brought down yesterday in aerial fighting. A great many French civilians were killed by British aviators who dropped bombs on the hospital at Turcoing."

GREAT BRITAIN

(March 5th)

"After two days of wind and rain the weather cleared slightly on the afternoon of Tuesday," says the official report of March 6th. "Bombs were dropped on railway sidings northeast of Lille.

"In air fighting two hostile machines were downed and one was driven down out of control. One of ours is missing.

"After dark the Ingelmunster Railway station and an aerodrome northeast of St. Quentin were heavily bombed. All our machines returned."

The War Office communication dealing with aerial operations on the battle front, issued March 7th, says:

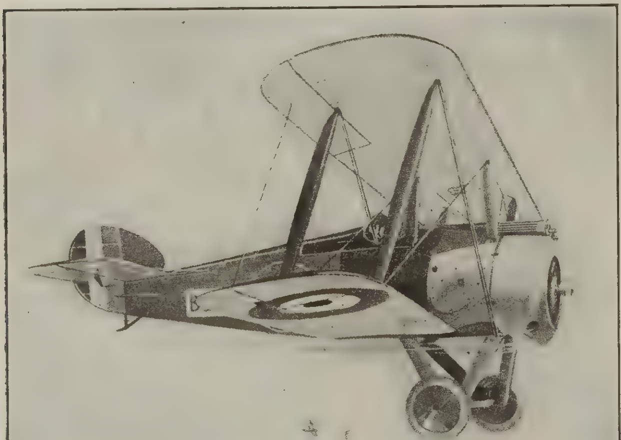
"There was fine weather Wednesday, and great aerial activity on both sides. There was continuous fighting between our scouts and enemy machines, which persistently attacked our bombing and artillery machines.

"Ten German aeroplanes were downed and ten others disabled. Three of our machines are missing."

Allied aerial superiority on the Italian front is freely admitted by captured aviators, says the British announcement issued March 5th, which is quoted below:

"Since the last report the weather has been dull and flying has only been possible one day, on which we destroyed three hostile machines. Captured aviators admit freely Allied superiority in the air, and say that great damage has been done to the aerodromes and machines, especially in the past two months.

"In the past twenty-four hours the weather has become very bad, with storms and snow in the mountains. The usual patrol and artillery activity continues whenever possible."



Sopwith "Camel" fighting biplane

The Germans conducted an aerial raid on London on the night of March 7th, resulting in 11 deaths and 46 injured.

The official statement on the raid said:

"Last night's air raid appears to have been carried out by seven or eight enemy aeroplanes, of which two reached London. The first two raiders approached the Isle of Thanet at about 10:55 P. M. and proceeded up the Thames estuary. Both were turned back before reaching London.

"Meanwhile the third raider came across the Essex coast at 11:20 P. M. and steered west. At 11:45 P. M. it was reported over East London. A few minutes later it dropped bombs on the southwestern and northwestern districts. At 11:50 P. M. the fourth raider, which also had come in across Essex, dropped bombs to the north of London and then proceeded south across the capital, dropping its remaining bombs on the northern district between 12:20 and 12:30 A. M. The remaining enemy machines, all of which came across the Essex coast, were turned back before they reached London. A certain amount of damage was caused to residential property in London. Several houses have been demolished."

In the month of January, says an official statement issued by the War Office on March 4th, the Germans dropped 1,482 bombs in the aera occupied by British troops in France. In the same period British aviators dropped 7,653 bombs in enemy areas.

The Germans dropped only 221 bombs in the daytime, the statement adds, while the British dropped 5,900 between sunrise and sunset.

The Air Board of Great Britain is issuing instructions to manufacturers of aircraft regarding efficient methods of cutting aircraft lumber. Diagrams are circularized showing the correct way of sawing up planks of various grains.

The Ministry of Munitions has assumed control of the supply of tin in Great Britain under the provisions of the Defence of the Realm Act. The immediate result of the measure was a falling off in the market price of tin.

Speaking at the Royal Institution, Professor Pope stated that air photography for military purposes is now being done with the aid of plates sensitive to the several colors of the spectrum.

HAWAII

Major Harold M. Clark, Sig. Corps, U. S. A., who is stationed at Fort Kamehama, H. T., recently made three flights in a seaplane over the island of Oahu, on which the city of Honolulu is located. His report of air conditions was so favorable that a Hawaiian note prophesies that within five years Oahu "may develop into one of the greatest aviation stations of the U. S. Army and Navy," as the climate there is believed to be favorable to flying at all seasons of the year.

ITALY

"The Minister of the Navy," says a diplomatic despatch from Rome dated March 4th, "states that on the night of February 27-28 a squadron of Italian aeroplanes bombarded Pola with two tons of explosives. Hits on the arsenal and other military works were observed. The aeroplanes returned safely to their base, notwithstanding the enemy's fire.

"All Italy is very indignant over the savage brutality shown by enemy aviators during recent air raids over Venice, which had as their exclusive object the damaging of the monuments. Two of the enemy machines fell into our hands. One Albatross was forced to land within our lines. The occupants attempted to set fire to their engine, but were prevented by Italian soldiers, who captured them. One of the enemy officers was found in possession of a plan of Venice."

Bombing of enemy aerodromes is reported on March 6th as follows:

"Our aircraft bombarded the enemy aviation ground at Motta di Livenza and a column of troops marching in the neighborhood of Oderzo. A British aviator brought down a hostile machine."

The official statement of March 7th reports the following aerial activity:

"British batteries and aviators downed hostile aircraft and set fire to two captive balloons. Naval seaplanes dropped two tons of bombs on enemy encampments below Griselera, on the lower Piave."

Professor Pio Foa, of Torino, declared in the Senate to-night there were so many aviaion camps in Italy that the wheat areas were being seriously restricted.

RUSSIA

A Petrograd despatch to the Exchange Telegraph Company, dated March 4th, says that despite the cessation of hostilities, a German aeroplane appeared over Petrograd at five o'clock the preceding afternoon and dropped bombs in various sections of the city, resulting in three deaths, and five injured. This is the first time an aerial attack has been made on Petrograd.

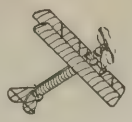
Aeroplanes were seen flying over the Nevsky Prospekt, and the belief prevailed that the enemy was aiming at the Nicholas station.

On the night of March 3d, Zeppelins were observed at Gatchina, thirty-five miles from Petrograd, flying toward the capital, but they were driven off by anti-aircraft batteries.

A delayed despatch describes the part aeroplanes played in the capture of Pskov. It is stated that an armored aeroplane acted as a scout for the German cavalry advancing along the railway. When the aeroplane hovering over Ostrov signalled that the evacuation had begun, the cavalry rushed up at full gallop.

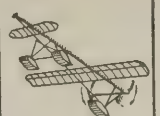
SPAIN

While flying at a low altitude over the Cuatrovientos aerodrome, a Spanish aviator, Captain Souza, dashed into a platoon of soldiers. It is reported that three persons were killed and seven injured as a result of the accident.



MODEL NEWS

Edited by G. A. Cavanagh



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Oxford, Pa.

A Compressed Air Engine for Model Aeroplanes

For quite some time it has been the desire of model flyers, both in this country and abroad, to find some means of substituting rubber strands as motive power for model aeroplanes. Various types of engines requiring the use of compressed air, steam, gasoline, carbonic gas, electricity, etc., have been offered, but although each in a way has suggested a solution of the problem, perhaps the most promising type of engine is that embodying the use of compressed air.

The Two Cylinder Opposed Type Engine

During the past few years model flyers of inventive ability produced many interesting types of compressed air engines, of which the following types seem to have been most successful two cylinder opposed, three cylinder stationary, three cylinder radial, four cylinder upright and four cylinder radial, opposed. But perhaps of all the different types mentioned the two cylinder opposed has been more often appreciated by model flyers; first, on account of its simple design; second, because of the comparatively small expense involved in its construction, and third, because it has been proven practical.

The making of one of these interesting compressed air engines does not require the use of an elaborate machine shop, but merely a set of simple tools consisting of a file, drill, small gas blow torch and a vise. In laying out the work the first thing that should be done is to secure two fishing rod ferrules (female) for the cylinders and an additional set of ferrules (female) for the pistons, described in a following paragraph. Also purchase another set of ferrules (male) from which to cut the cylinder heads. Such ferrules can be purchased at most any Sporting Goods store. After the ferrules have been gotten, the female ferrules should be filed down until they measure two inches. They should then be cut in from the end ¾ of an inch and again cut through as much as ¾ of the diameter. Fig. 7. For the cylinder heads, cut off the tops of the male ferrules so that they have a depth of ⅛", then through the center bore a hole ⅛" in diameter into which, later on, the intake pipes are soldered. Next solder the heads to the cylinders, using soft wire solder.

Pistons

One thing most essential in making the pistons is that they operate freely, and to do this both ferrules should be rubbed very carefully with a rag that has been saturated with oil and upon which fine powdered emery has been shaken, then, measuring from the closed end ½" cut out both pistons, Fig. 5-a. The connecting rods should be made from brass tubing, each piece measuring 1¼" long by ⅛" in diameter, and to facilitate the boring of a hole at each end, the ends should be flattened. Fig. 6. Through the flattened ends of each rod bore a hole 3/32 inch in diameter. From a solid piece of brass, ¼" in diameter by ½" in length, two studs should be cut, each stud to measure ¼" in diameter by ¼" in length. These studs are to be used in connecting the piston rods to the pistons, but to enable this, both studs should be slotted from one end deep enough to receive the end of the piston rod, Fig. 5-a, after which a hole should be drilled through the stud for the insertion of a steel pin to hold the piston rod in place and yet enable it to operate with ease. The stud with rod connected should be soldered to the head of the piston, Fig. 5-a.

Valve Mechanism and Crank Shaft

One would suppose this section of the engine to involve considerable work, but anyone so thinking need only to ask one who has made an engine of this type to find that it requires only a slight knowledge of mechanics. In making the outside valve mechanism serve as a bearing for the crankshaft as well as a casting, brass tubing ¼" in diameter by 1½" in length should be used. For the valves and exhaust port three holes should be drilled through the tubing, Fig. 4, each hole having a diameter of ⅛" and drilled ½" apart. The valve shaft, also crank shaft, used in connection with this engine also serves as an accommodation for mounting the propeller and is cut from a drill rod 2" long by 3/16" in diameter, Fig. 3. As part of the valve mechanism this drill rod should contain two cuts, one on either side, as illustrated, one cut being 1" from the stud end the other ⅜", both one-half inch by 1/32" deep. The stud end constituting that end to which the connecting rods are attached. However, in order to accommodate the piston rods that they may function properly, a crankthrow is necessary, and this may be made from a piece of flat steel 3/32" thick, ⅜" in length by ¼" in width containing a hole at each end, the holes being ½" apart and measuring 3/16" in diameter.

As shown, one end of the throw is soldered to the end of the crankshaft, while into the other end of the throw is soldered a piece of drill rod ¼" in length by 3/32" in diameter. It is to this end of the throw that the rods are connected, Fig. 1-f.

The Air Tank

A satisfactory tank, one that will serve well for experimental purposes, can be made from a sheet of brass or copper foil 15" long by 1/100" in thickness. By twisting the sheet of metal a cylinder is formed, but must be rendered strong and airtight by soldering the edges together. For the ends of the cylinder or tank obtain two small oil cans, each measuring 2½" in diameter, or the same diameter as that of the tank. But before soldering the cans, now considered as caps, to the ends of the tank, the holes in which formerly the spouts were inserted should be closed and rendred airtight, and to do this two small metal discs can be used, solder being used to hold them in place. An air valve can be made from a bicycle air valve and soldered into one end of the tank, as illustrated, Fig. 2, and for the insertion of a small gascock or outlet valve in the other end a hole sufficiently large enough should be drilled. Before soldering the cock or valve into place render it lighter and more efficient by filing away all unnecessary or surplus metal, Fig. 2.

(*To be continued.*)

Eugene J. McGuirk of Biloxi, Mississippi, designed and built this model. You will agree with us, no doubt, it's a dandy. Because of it's attractiveness and clever design Mr. McGuirk received offers from several large stores in his home town and other cities to loan the model for exhibition purposes. The model measures six feet from tip to tip

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Jovial Airman

I "take off" from the spring-y lawn,
I hover with the lark at dawn,
  I rise, I call,
  I glide, I "stall,"
Exuberantly, I fly through space,
My outstretched wings increase in pace,
With early morn I run a race.

I am a swallow on her flight,
I catch the golden-tinted light,
  I "bank," I "loop,"
  I climb, I whoop,
Delightedly, I breathe the air,
I quaff the ozone rich and rare,
And to the breeze my cheek I bare.

I revel in my engine's song,
I watch, and hum my way along,
  I laugh, I sing,
  I shout, I fling
Exultantly the earth away.
I dally, for I fain would stay
And live near Heav'n for one brief day.

I see the mellow tints of morn,
I joy with day so newly born,
  I rise, I glide,
  I climb, I ride
Triumphantly above the rain
That penetrates with might and main
The woods and dells and mountain chain.

I end my flight and caper round,
I gently volplane to the ground;
  I pine, I throb,
  I sigh, I sob,
With nimble feet to earth I spring,
With airy voice I laugh and sing,
My heart and soul have been a-wing!

W. S. T.

New Aviator (first time out): I'm afraid to take this back now. What'll the captain say?

I've been through all the sicknesses,
  Among them 'pendicitis,
When I felt bad, and wanted to be glad
  I read the page, *Aeronitis.*

Sickness was my hobby,
  Best of all was tonsilitis,
But it is nothing, but the stuffing
  Of the real Bird, *Aeronitis.*

Along around my fifteenth year
  I got acquainted with Bronchitis,
For my own sake, they didn't take
  From me my *Aeronitis.*

When I feel angry at the World
  And get an attack of the "Blueitis."
I buy a copy of AERIAL AGE
  And turn to *Aeronitis.*

M. G. G.

Not Much!

The omniscience of the Comptroller of the Treasury is completely ilustrated by the following incident. In a case that came before him for decision appeared the name of a civilian with these initials after it: "I. A. and A. E., S. S. L." Did this stump the Comptroller? Most decidedly not, for he goes calmly on, "which I take to mean Inspector of Aeroplanes and Aeroplane Engineer, Signal Service at Large."

Merely a Banker; An Air Raid Tale

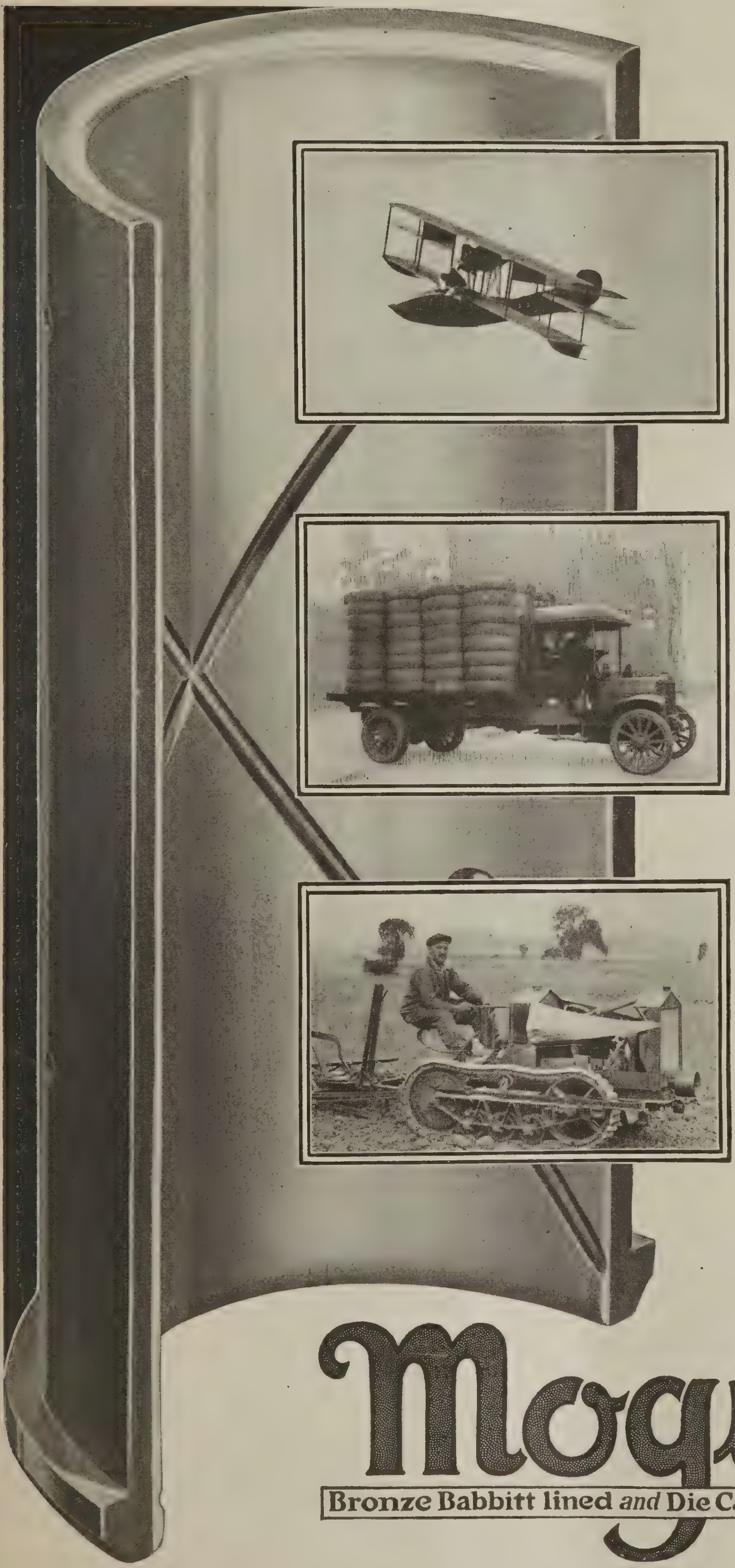
During a German air raid a British three-inch gun mounted on an automobile truck took up its position in a fashionable residential district directly in front of the house of a wealthy banker. The banker stood the racket of the barrage fire for a time but then walked out and said to the officer in charge:

"I say, would you mind taking that thing a little further down the street? We don't like the row and it is fairly shaking our walls."

The young lieutenant was non-plussed for a moment.

"Look here," he finally snapped out, "do you take this for a blooming hurdy-gurdy?"

And the barrage went on.



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THE WORLD BASING POINT FOR PIG-IRON—BIRMINGHAM

By BLANKS EVERETT

General Manager of the Birmingham Chamber of Commerce

BIRMINGHAM, the world's basing point for pig-iron, is situated in the northern half of Albama, but so close to the center that it is regarded as the hub of the State both geographically and by virtue of her gigantic industrial activities. She closely hugs the base of Red Mountain, a mountain of wealth, which stores vast treasures of iron ore, and each year discloses heretofore undiscovered mineral wealth.

The immediate center and business portion of the city is built upon the bottom of the valley, her residence sections spread out toward every point of the compass. On the north magnificent dwellings are built upon a slightly elevated plateau, on the east and west follow the valley, but on the south palatial homes with spacious grounds dot the mountain side and some have been so bold as to top the mountain's peak.

Topographically Birmingham is nearly ideal. The business district is laid off into uniform squares, the streets and avenues dividing them are wide, well paved and numbered. The streets run north and south, the avenues east and West, making the location of any desired point, by the veriest stranger an easy matter. This method of naming the streets and avenues is carried a little way into the residential section of the city, or until the elevations are reached.

Highland Avenue, which is said to be the most beautiful street in the south, gracefuly winds along the mountain, where other fashionable avenues branch from it and gradually wind up the mountain sides, sometimes they disappear over the top, sometimes they terminate at many of the handsome houses now situated there. Good roads and well built driveways follow the mountain top for miles, affording one a wonderful view of the valley and city below with its great population and stupendous industrial activities. At night a view of the Birmingham district from his height is awe inspiring. Myraids of arc lights, huge electric signs and the lamps of the great white way glitter and twinkle like millions of fire-flies. This panoramic view is flanked at each end by the great red-gold glow of the furnaces and coke ovens. At a distance of twenty miles the reflection of other furnaces in the immediate district can be seen.

The Birmingham district stands out, far from all other sections of the state, and the south,—and because of her incalculable wealth of iron ore and coal is one of the important districts in the country at this particular time and is indubitably destined to maintain that position in the future.

Though less than fifty years old, this city has a population, according to the United States census, of more than two hundred thousand. It has the distinction of being the only city in the world to increase its population 200 per cent within five years.

The rapid growth and development is not accidental. It is due to the genial climate, making it possible for the workman to engage in his trade almost every day in the year, the quantity of pure water, the numerous minerals in inexhaustible supply right within borders available and so easy of access that industrial plants of immense proportions offer employment for both skilled and unskilled labor. While this district is distinctly industrial it holds attractions for truck farmers and small shippers of agricultural products, and manufacturers of many kinds of clay, wooden articles cotton cloth, hose and garments.

Birmingham, commercially and industrially is not a typical southern city, its unlimited supply of suitable and cheap material for the manufacture of iron and steel commodities, including armor plate and munitions, its rail and water facilities for distribution of the finished products, its nearness to southeastern Atlantic ports, gulf ports, Panama Canal and Pacific ports, its splendid labor conditions, as evidenced by the successful operation of the steel plants, blast furnaces, machine shops, mines, lumber mills, etc., its proximity to vast undeveloped and potential hydro-electric powers and its location in the midst of enormous coal fields attracts financiers and industrial magnates from the world centers,—all this has made Birmingham one of the most cosmopolitan cities of the world. But,—with all of these thousands of representatives of other parts of America and other parts of the world, one finds the atmosphere of true southern hospitality within her gates.

Birmingham, because of her manufacture of large quantities of machinery gets revenue from improvements and investments made in all parts of the State, from the sixty million Government nitrate plant at Sheffield in the extreme northern part of the State to the big ship building yards at Mobile on the gulf coast.

Because of the limestone, coal and iron ore in this immediate district iron can be, and is, manufactured here cheaper than in any other place in the world, and for that reason is the basing point for pig-iron prices in the United States.

Retail trade comes to this city from a radius of one hundred miles. Wholesale trade extends to adjoining states and foreign trade extends to all foreign countries

Transportation facilities are exceptionally good. Trolley mileage is approximately 150 miles or about the equal to that of the surface lines of New York City. Fifteen miles is the maximum distance of a five-cent ride. Eight of the largest trunk line railroads in the United States enter this city. One of those, the Southern Railway, presents the most unusual situation to be found in any city in the United States, because it has five actual main lines radiating from Birmingham. Besides these numerous trunk lines there are two efficient industrial lines within the district. In every direction going out of Birmingham there are at least three standard, fully equipped trunk lines, and in some cases main paralelling lines.

In a short time water transportation will be a common means of moving products. Already a large consignment of dry goods has been brought from New York to Birmingham by the Warrior River route, at a gratifying rate to the buyer. This river is navigable all the year round.

Birmingham is the home of the National Good Roads Association, the Alabama Good Roads Association and the Bankhead National Highway Association, meaning that the offices of those organizations are maintained here, and many of the strongest advocates for good roads live here.

Twentieth Street and First Avenue is the most highly developed corner in the south. There are more than two thousand occupied offices in the four buildings at the intersection of these streets. Property on the corner of Nineteenth Street and Second Avenue is the most valuable business property in the south. Within the past few years a two million dollar terminal station has been finished. Concrete viaducts are being built over all grade crossings. Large and modern hotels take care of the transient visitors and the largest and most completely equipped apartment houses in the south are located not only in the fashionable residence districts but within short walking distance of the immense office buildings. Housing conditions are generally good and are being improved all of the time. Eleemosynary institutions care for the needy. Many of these occupy and own substantial buildings giving inmates many physical comforts.

While Birmingham's industrial activities cause the eyes of the world to be focused upon her, she is also coming to be recognized as a city of cultural attainments. Among the many national conventions held here during the year, none were more appreciated than the Bi-ennial of the Federated Music Clubs of America.

It was said by the National Playgrounds Association that Birmingham made the greatest progress in establishing and developing her playgrounds and playground system than any other city in the United States. Through the Community Sings, which were inaugurated during the Summer, she has attracted much attention and merited from musicans of note and National music publications throughout the country.

The public school system is considered by educators, with national reputation, to be one of the three best in the country. There are forty-five schools for white children and twenty-one schools for negro children, and appropriations already made for the building and equipment of a half dozen more. Especial attention is given to industrial education and vocational training. The night schools have better attendance than any other night schools in other southern cities.

Besides the very excellent public schools there are thirty-six private schools and colleges, including colleges for young men, young women, medical and dental colleges, sectarian and dominational schools, business colleges and schools of music and art. These various educational institutions operate for the standard school term of nine months with the exception of the business colleges, which are open the entire twelve months.

Five public libraries with adequate help supply those bent on reading for amusement, instruction or research work, with the necessary books and periodicals.

Three daily papers beside many smaller papers are published here. The most modern newspaper plant in the south has just been completed. Among the large buildings is the Jefferson County Bank building, twenty-six stories high, also the tallest building south of the Ohio River. It is built of white marble and stone quarried in Alabama. Banking facilities are commensurate with our needs.

Immense department stores supply the need of this and surrounding territory.

Large and enthusiastic civic bodies are over active in interesting and locating business of all branches for Birmingham and the Birmingham district.

The Food Preparedness and Marketing Bureau of the State has its offices in the Chamber of Commerce Building and has done such splendid work among farmers and merchants that the crops were more than doubled the past year.

All secret and benevolent orders, and labor bodies have local organizations in Birmingham.

The Young Men's Christian Association, The Young Women's Christian Association and the Young Men's Hebrew Association with the Birmingham Athletic Club take care of the physical and moral welfare of the young people.

Birmingham's Country Club is the pride of Alabama. Other promi-

(*Continued on page* 66)

"…..during 1914, 1915, 1916 and 1917 we have replaced cylinders, pistons, piston-pins, connecting rods and all other parts of motors, but we have never replaced a part where Non-Gran formed the main surface of wear."

THIS statement of fact, taken from a letter written in the interest of what proved to be the most thorough investigation of bearing bronzes ever conducted in this Country, was made over the signature of one of the largest makers of fine motors in America.

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NEW·AERONAUTICAL·BOOKS

Military Observation Balloons

With a balloon squadron to be the first aerial unit in service on the American sector of the front in France, particular interest attaches to this branch of the service, and consequently the book "Military Observation Balloons," by Emie J. Widmer, which has just come from the press is opportune. The book deals with the manufacture, equipment, inspection and handling of military observation balloons. It is based on the balloon manual of the Germany army, including the drill and equipment in use at the beginning of the war. The three plates and 38 illustrations are well chosen. Altogether the volume is one which every student of the aerostatic section of our aviation corps should read. It contains 157 pages of text and costs $3.00 postpaid.

The Lewis Gun

Every aviation cadet should be familiar with the Lewis Machine Gun operation, and consequently should peruse the handbook on "The Operation and Tactical use of the Lewis Automatic Machine Rifle," which is now available, and which sells at 60 cents.

A Useful Encyclopedia

Dyke's Automobile Encylopedia is a book well deserving the attention of the aviator and the air mechanic for, although it does not specifically deal with aviation engines it treats the subject of internal combustion engine in such a comprehensive manner that the working of the stationary aviation engine becomes self-explanatory. The fact that the Signal Corps Aviation School at San Diego, Cal., is using this book in its course of instruction particularly recommends Dyke's Automobile Encyclopedia to the aeronautical student.

The book is not what one might term an encyclopedia in the true sense of the word, yet it is one of the most complete reference works on automobiles published; any subject, trouble, remedy or repair one can think of can be found in the 6,000 lines of index.

The repair subject is, perhaps, the most interesting part of the book. There are 1,189 illustrations and 154 pages devoted to this subject alone. Other instructions cover such subjects as: how to build a repair shop for home or business, and how to equip the shop from small tools to regrinding cylinders. Tire repairs, welding, battery charging, etc., are thoroughly treated. The reader is taught how to use tools; how to cut threads; how to distinguish S. A. E. and U. S. S. threads; how to use and read measuring instruments; how to solder, case harden and repair radiators; how to redesign old cars; how to straighten frames, fenders, etc.

The subject of oxy-acetylene welding is very complete and fully illustrated. The instructions on ignition systems cover the entire field and in a simplified manner which anyone can understand. Instructions on the electric starting, generating and lighting are simplified with hundreds of clear illustrations of diagrams. There are 775 illustrations and 279 pages devoted to electric matters, including the storage battery and ignition subjects. In addition there are two supplements on the Ford and Packard cars, with 91 pages and 332 illustrations, a part of which are printed in two colors.

Military Sketching

"Military Sketching and Map Reading" is a new volume by John B. Barnes, based on an expert knowledge of the subject as taught by the Service School, Fort Leavenworth, and an appreciation of the needs of beginners through his wide experience as an instructor of National Guard Officers and at Officers' Training Camps. Written with a view of self-instruction, with new and original illustrations that explain simply and graphically the points that are usually found troublesome to beginners.

The volume is of handy pocket size and sells for 75 cents.

Telegraph Practice

John Lee, M.A., has done a real service by preparing a book on "Telegraph Practice: A Study of Comparative Method," which might be described as a precis of the international methods and practices in this science. It outlines the fundamentals of telegraph practice in such a way as to indicate differences in method as adopted by different administrations. Price $1.00.

Aero Engine Chart

The aviator cadet who has hopelessly endeavored to conceive the many sources of trouble in his motor will appreciate the chart which Lieut. Victor W. Page, of the Aviation Section, S. C., U. S. R., has prepared. It presents a typical aero engine in part section with all the important components shown and outlines all possible troubles apt to materialize considering the auxiliary groups, such as cooling, lubrication, carburetion and ignition. It is of wall chart size and yet can be readily folded to carry in the pocket. Price 50 cents.

Glossary of Aviation Terms

For our airmen who have to think of the components of their machines in French towns, as well as in English, Lieutenant Page's "Glossary of Aviation Terms" will be very useful. The volume contains lists of common aeronautical terms in English with French equivalents, and in French with corresponding English words so it is equally well adapted to French- and English-speaking aviators. The book is well illustrated, and each illustration shows various parts with both English and French names of same. It is divided in four parts, the words being alphabetically arranged to facilitate study. It is intended that this book be used to supplement the usual French-English phrase books which have no aviation terms. While this book is not a dictionary, illustrations are given to enable one not familiar with meaning of aviation terms to see the actual parts referred to. Price $1.00.

The Gas Motor

Under this title Max Kushlan has produced a small volume which deals in general with the internal combustion engine, with a few chapters specially relating to aviation power plants. The elementary student will find the work easily understandable and a stepping stone to more technical works. It is illustrated with half tones and line illustrations and contains an appendix having reference tables of value. It's complete index makes its contents accessible.

Military and Naval Recognition

For those who desire to recognize the service of our uniformed citizens, Lieut. J. W. Bunkley's "Military and Naval Recognition Book" will be useful. It contains 51 full-page plates, 18 in colors, of all of the uniforms and insignias in the various arms of the service and sells for $1.00.

Cavalry of the Clouds

The reading public of England are familiar with the newspaper articles of "Contact," Captain Alan Bott, M.C., and American readers will enjoy the opportunity of reading of his exploits in the air in his latest book, "Cavalry of the Clouds." Major-General W. S. Brancher, Deputy Director-General of Military Aeronautics in Great Britain, has written an introduction to the volume in which he discusses the changing conditions of strategy through aerial observation.

"Contact" describes in thrilling fashion his many escapades in the air, and while his stories appeal to the layman, there is much real information in the book for the air student and the prospective air fighter. Price, $1.25.

An Officers' Notes

Captain Ralph M. Parker has done the Reserve Officer a real service by putting in book form "An Officer's Notes," which provides information on the many irksome points that daily arise, in the carrying out of his duty and in the issuance of orders. It deals with military law, court martials, furloughs, issue of rations, exercises, discipline, commands, notes on topography, etc. In other words, the kind of information which previously had to be secured from many sources has now been collected and presented in a handy small volume size. Price, $1.25.

Gas-Engine Principles

"Gas-Engine Principles," by Roger B. Whitman, is a guide for the user of the small stationary internal combustion engine. The first chapters explain the principle of operation of the gas engine, and describe in detail the various constructions that are employed in the engines on the market. The remainder of the book is given up to practical explanations of the setting up of a new engine, the economical operation of engines, engine care and maintenance, and explanations of the troubles to which engines are subject, together with their remedy and prevention. The book is written with the greatest possible simplicity of expression. The illustrations are especially prepared line drawings made by the author, each one specifically illustrating some particular point or construction. Price $1.60.

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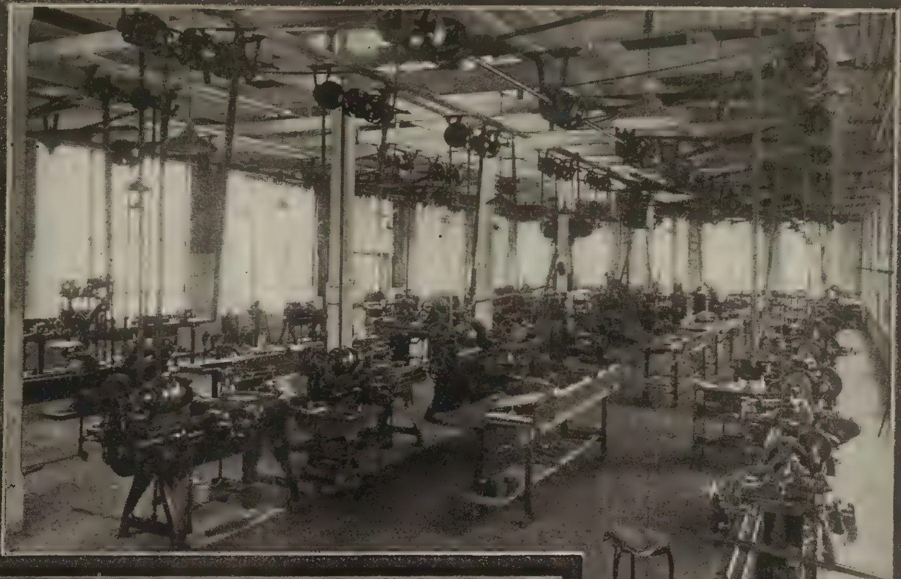

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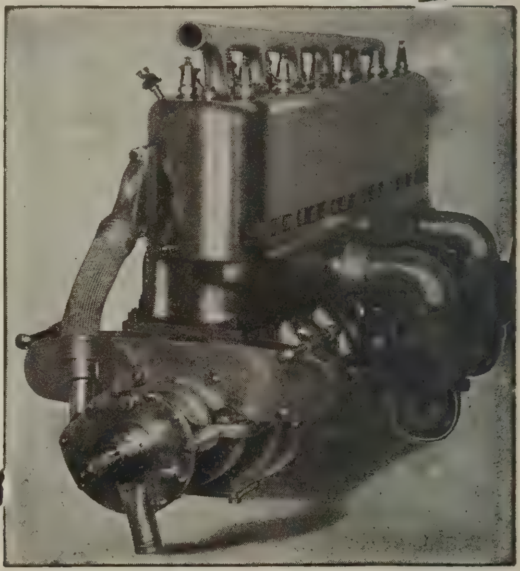

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An efficient, dependable aircraft power plant that offers many distinct advantages to the aeroplane constructor and the aviation school. Possesses those three necessary qualities in an aircraft motor—Reliability, Dependability and Power. The ideal motor for training schools.

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Specifications:—Two cycle, Water Cooled, Six Cylinder, cast en bloc. Valveless and Gearless. 5" bore 5½" stroke. Absolutely simple in construction. Two Miller Carburetors. Two High Tension Magnetos. Aluminum Base. Drop forged hollow Crank Shaft. Ample sized die cast bearings. Lubrication simple and positive in action. Normal speed 1200 R.P.M. Weight approximately 368 pounds. The Roberts Patented Cellular By-Pass absolutely prevents back-firing. A high grade motor at a medium price.

Write for Full Descriptions, Blue Prints, Prices.

Roberts Motor Manufacturing Company
305 Roberts Bldg., SANDUSKY, OHIO

(*Continued from page* 62)

nent social clubs are The Roebuck Springs Motor and Country Club, having eighteen hole golf course unsurpassed by that anywhere else in the state; the Edgewood Club and the Phoenix Club, the last, a Jewish club, complete the list of the leading social clubs.

Four legitimate theatres furnish the very best of attractions during the theatrical season. Three vaudeville houses furnish high class attractions all the year, and a dozen well lighted and modern motion picture houses give pleasure to thousands daily.

Fourteen parks including two for negroes exclusively, afford ample place for recreation and out-of-door amusement.

Birmingham has Commission Form of Government which has been tried and found to be far superior to the old aldermanic order. Five commissioners, elected by the people, stand at the helm and occupy the watch tower of the municipal ship. A completely equipped modern fire department and alert police system give protection to property and citizenry.

It is not by chance that the United States Steel Corporation recently invested another $11,000,000 in this district in addition to the forty million dollars previously invested by the same concern, nor is it by chance that other million dollar investments are being swung to Birmingham.

This article does not deal with the future of this world important city, for Birmingham is essentially and intensely a city of the present, and there is no doubt as to her future. But should one reason from cause to effect and consider the present city, the cause, then the deduction will necessarily follow that the effect,—Birmingham of the future,—will rival any industrial center of the world.

Without Many Aeroplanes We Cannot Win the War

(Editorial in N. Y. *American*)

THE War Department has asked Congress for $450,000,000 to build more aeroplanes.

Four hundred and fifty million dollars is a great deal of money, but it is very little compared to the amount of money it will cost the country to lose the war.

The country cannot afford to lose the war. It does not intend to lose the war. It is going to win the war.

And for that reason everything that will help us to get enough aeroplanes and enough men to fly in them must be done without delay.

Fighting an army with plenty of aeroplanes is an even battle if the contending army also has plenty of aeroplanes.

All America asks of an enemy is an even battle.

But for one army without aeroplanes to fight an army with aeroplanes is exactly like a blind man fighting an adversary whose eyes are wide open.

The great Italian offensive of the Germans was not undertaken till the Germans had first secured the mastery of the air.

When they had destroyed the Italian aeroplanes they brought up their forces and made their assault.

It was successful, because General Cadorna's troops, deprived of their eyes, could not see what the Germans were doing. They could not tell where the offensive was to be launched, how many troops were being massed, or how heavy artillery was being brought to bear upon their line.

If they had had the same knowledge of the Germans' movements as the Germans had of theirs, they could at least have held back the great advance until help could have been brought from France and England.

In every offensive of the war the first battle has been fought for control of the air, and the side that has secured it has begun the attack.

And always the side that has gained the advantage in the air has done so because it had the most aeroplanes in the air and in reserve.

With more aeroplanes than your enemy it is merely a matter of arithmetic in putting him at least temporarily out of business and utterly blinding him to your movements.

America is better equipped to build aeroplanes than any other nation now engaged in the great struggle.

It has all the material ready to hand. It can build better aeroplane machinery, and American mechanical skill can be depended upon to make improvements more rapidly than any other nation.

But all these resources are useless without money.

Only by great expenditures now can our aeroplane fleet be made what it ought to be.

This is no time for Congress to do any cheese paring.

The War Department has expended wisely all the money given to it by Congress.

We have a great fleet of air fighters under way, and a great army of men to man them under training.

But it will be impossible to have too many of either.

Aside from the absolute necessity in the present war of air observation, there is the tremendous destructive power of an aeroplane fleet which shall be strong enough first to overpower the enemy fleet, and second to make air raids over the enemy country.

Were any nation now engaged in the war able to send forth aeroplanes in fleets of a hundred or two hundred to bomb the

(*Continued on page* 72)

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(*Continued from page* 35)

Strickland, Chauncey J	SLR
Sutphen, Edward A	SLR
Smith, Maynard L	SLR; GLC
Spindle, William H	FRF
Sands, Richard E	GIT
Stevens, Charles Zackery	SLR; PFO
Sileo, Cavio F	SLR
Simon, Jr., Louis C	SLR
Sheffield, Frank Herman	SLR; EHT
Seiler, Frederick Elie	FLR; EHT
Sutton, Arthur J	FLR
Smith, Melville Darling	SLR; KST
Simmons, John A	REV
Seward, Charles D	SLR
Stevens, John H	SLR
Scanlon, John L	SLR
Shillingford, George W	SLR
Simonin, Frederick L	SLR
Slade, Russell C	SLR
Scheffler, Eugene Manoni	FLR; VBW
Schnur, Philip Becker	SLR; THT
Spencer, George Selden	SLR; CSO

T

Taylor, Carroll G	SLR
Taubert, William H	FLR; GIT
Thummel, George B	SLR; FOB
Thorn, Robert M	SLR
Tenner, Edward E., Jr	SLR
Thomas, Clyde	SLR
Turley, George A	SLR; GIT
Tidrow, Robert E	CPR
Tilney, John M	SLR
Tompkins, Frederick	SLR; GLC
Tompkins, Sterling	SLR; GLC
Tansley, Thomas L	SLR
Taylor, Carroll Gholson	SLR; GLC
Tansley, Thomas Liomel	SLR; GLC
Thompson, Lyman H	UTA
Torrey, Owen C	SLR
Tait, Arthur L	SLR
Teichman, Herbert H	SLR
Thomas, Charles S., Jr	SLR
Tompkins, Frederick	SLR
Tompkins, Sterling	SLR
Thomas, Hayward C	SLR
Tuten, James A	SLR
Taylor, Thomas C	FLR (Note 1)
Trainor, Francis C	FLR (Note 1)
Thomas, Harold S	RWT
Twigg, George L	FLR (Note 1)
Thomas, Clyde	SLR; GLC
Tonkin, Thomas C	FRF
Taylor, George de B	REL; UTA
Thompson, George K	SLR
Titus, Silas J	SLR
Ten Eyck, Jr., Walton B	SLR
Thomas, Gerald P	SLR
Todd, Robert M	SLR
Tanner, Jr., Edward Everett,	SLR; EHT
Thomas, Murchie R	SLR
Tuttle, Jerry L	SLR
Thomas, Roy A	SLR; PFO

U

Upston, John E	SLR

V

Van Siclen, Matthew	FLR
Van Buren, Harry M	SLR; AGC
Van Horn, Harry Arthur	SLR; EHT
Van Auker, Cecil K	RWT
Vandervort, Henry C	SLR
Verbeck, Roland H	FLR (Note 1)
Van Inwegen, H. Barentsen	FLR (Note 1)
Vars, William W	RWT
Van Horn, Harry A	SLR
Vollmer, William H	FLR (Note 1)
Vivian, William R., Jr	SLR; AGC
Vadnais, Emile J	SLR
Vitoske, Wilbert H	SLR
Van Siclen, Matthew	FLR; KST

W

Williams, Theodore	CPR
Williams, George Livingston	SLR; CSO
Wheeler, Henry C	CPR; AGC
Wheeler, William D	SLR
Wheeler, John B. E	SLR; CWT
Willard, Daniel P. A	SLR; MIT
Wilson, Ralph Warren	FLR; CSO
Walters, Harvey H	FRF
Whittlesey, M. M	UTA
Welch, James W	FRF
Watt, Robert W	SLR
Wiegel, Arthur R	SLR
Wiser, Guy B	SLR
Willingham, James E	FRF
Watson, Elmer E	UTA
White, Wilbert W	SLR
Wood, Joseph, Jr	SLR; PFO
Webster, Stephen T	FRF
Wait, George Dexter	SLR; CSO
Webb, Clyde L	SLR; GLC
Worrall, Joseph A	SLR
Wyman, Everett L	SLR
Wall, John Harold	SLR; VBW
Werth, Robert William	FLR; CSO
Weimer, John H	SLR
White, Edgar G	SLR
Wilson, Hobert LaD	SLR
Wilson, Raymond	SLR
Welch, Charles H	FRF
Whitney, Frank B	FLR; PFO
Wilson, Alexander Hamilton	SLR; CAF
Wotton, Thomas	LDT
Wastell, Stanford C	REL; RTR
Waller, John Robert	FLR; CSO
Weddington, Harry	FLR
Woodley, Tom M	SLR
Weaver, Frank R	Note 18
White, William Alexander	SLR; Note 16
Winslow, Warren Wells	FLR; CMV
White, Joseph A	SLR
Wood, Joseph, Jr	SLR
Wilbur, Jesse B	FLR
Waller, John R	FLR
Werth, Robert W	FLR
Wright, Frederic W	CPR
Willis, Percy H	SLR
Weidenmann, Duncan R	SLR
Williams, Roy F	SLR
Wall, John H	SLR
White, Lucien S	SLR
Wilson, Alexander H	SLR
Walker, Byron B	RWT
Wood, Ivan D	SLR
White, Frederick Garfield	REV (Note 2)
Wienges, Paul C	SLR; AGC
Wilford, John C	SLR; AGC
Williams, Raymond A	SLR; AGC
Whitehead, John R	CPR
Wilson, Ralph W	FLR
Weber, Harold Christian	SLR; GLC
Woolley, Roy	SLR; GLC
Wright, Elijah F., Jr	SLR
Wait, George D	SLR
Webb, Clyde L	SLR
Wheeler, John B. E	SLR
Willard, Daniel P. A	SLR
Williams, George L	SLR
Watson, Forest Francis	SLR; KST
Winslow, Warren W	FLR
Wheeler, Harry C	CPR
Wetherell, Clifford T	SLR
Wooley, Frederick P., Jr	PUP
Weeden, Charles F	PUP
Wyatt, Clyde H	SLT
Williams, Henry M	FLR (Note 1)
Wright, Elijah Floyd	SLR; GLC
Waite, Walter E	FLR
Williams, Donald E	CPR
Weeks, Paul T	FLR
Wright, Cameron	FRF
Walker, Vivian L	SLR; AGC
Willis, William H	FLR; GIT
Wateman, Sherwood L	SLR
Walden, George S	FLR (Note 1)

(*Continued on page* 74)

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enemy, the war would be short lived. No army on land could compete with such an army in the air. No system of defenses ever devised could withstand such a terrible power.

Congress did wisely to pass promptly and without a question the first great appropriation for an air fleet.

How that money has been spent any Congressman can learn by going to the aeroplane factories, or to any of the fields where strong young Americans are learning the newest and best way of making war.

Under General Squier, who is in command of the Signal Corps, and the Aeroplane Production Board, of which Howard E. Coffin is chairman, the work has gone forward rapidly, and with almost miraculous results.

But is must be kept up. We need at this minute every aeroplane that we have. We shall need thousands more within a few months, and nothing must deter their speedy construction and delivery.

British Methods Conserve Spruce

In order to conserve the supply of spruce, of which a grave shortage exists owing to transportation difficulties, British aëroplane manufacturers are using hollow spars in almost any length, shape or size desired. Spars of all lengths and shapes have already been tested and proved to be equal, and more than equal to the best qualities of the solid wood, according to "The Aeroplane."

The present methods of applying silver spruce to aircraft construction are considered very wasteful, when some fifty per cent. of the wood has to be cut out to get the requisite degree of lightness. Instead of this method of hollowing out, the Robert Young Construction Company are building spars of thin veneers glued together to the desired section, strength and shape, to any length, without joints. No matter what the length of the desired spars may be, no scarfing or other joint is required. These spars are one continuous length of uniform strength. The necessary provision for bolts and all other fixings required for wireless installations, etc., are provided for in the building up of the spar.

The same methods are adopted for building up the heavy bearers for engines, etc., and this is accomplished in a more satisfactory form than can be done at present with solid wood.

The struts and spars are all reinforced in their interior construction in such a way as to give the greatest assistance to all stresses and strains without adding to the weight. The most searching tests have proved that these hollow spars give a greater efficiency than any solid silver spruce spar. They have successfully passed the humidity tests, and are reliable in all climes.

This method of construction is the property of the Hollow Structure and Aircraft Company of England, and the Young Company is the exclusive licensee.

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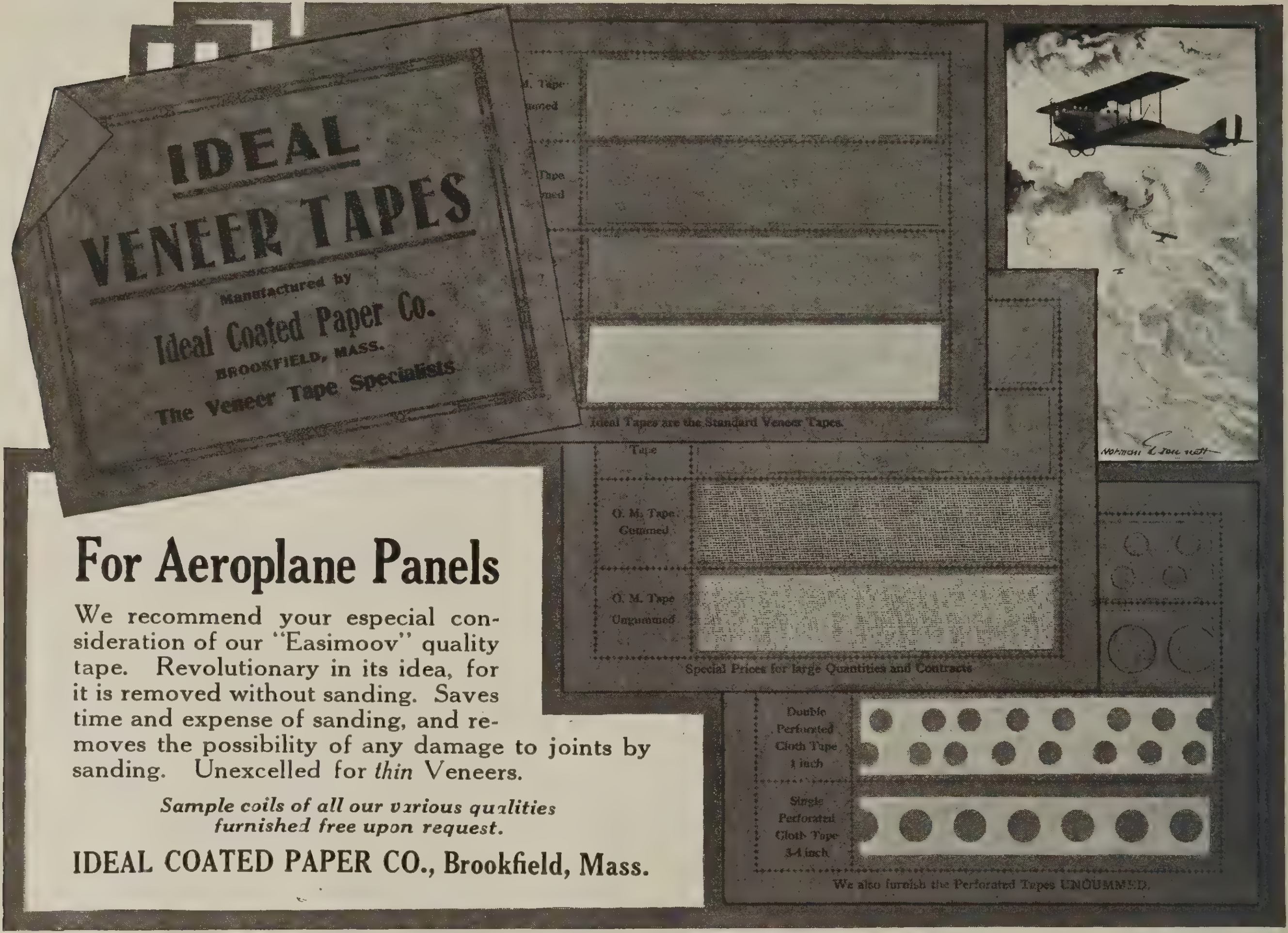
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Wilson, Lewis K.	FLR (Note 1)
Wyatt, Clyde H.	MIT
Weber, Harold C.	SLR
Wilson, Cecil D.	FLR (Note 1)

Y

Yarnall, Alexander C.	REL (Note 4)
York, Arch C.	(Note 8)
Yell, Edmund A.	SLR; SBI
Young, Thomas H.	RWT
Yarborough, Robert S.	FRF

Chanute Field News

Three aero squadrons have been sent to Chanute Field for training within the last few days.

"The "Black Bird"—the only black painted machine known—made its first flight at Chanute Field with Lieutenant Smith at the helm. This aeroplane belonged to Lieutenant Schroeder, who is instructing at one of the southern fields. In the machine Lieutenant Schroeder turned 31 loops at the Chicago Liberty Loan demonstration.

The addition of sixteen medical men to the staff at the hospital has increased the personnel of this division to forty-four.

American Aviators Win Mileage Record

Flying an aggregate distance of 35,000 miles in seventy-two hours, aviation cadets at the Rockwell Field, Worth Island Flying Schools, have all records for American aviation training mileage it was announced tonight. The number of machines used was not divulged, but the mileage was attained without the breaking of a single wing section or strut.

For the first time here Sunday flying was permitted today.

General Hoare Injured in Forced Landing

Gen. C. G. Hoare, supreme commander of the entire British Royal Flying Corps in Canada and the United States, narrowly escaped death, but was injured severely about the face and head in a forced landing at Hicks Aviation Field several days ago.

Northern France Scenes Reproduced at Great Long Island Flying Camp

The ground at Hempstead Plains, L. I., is being cross-hatched with concrete ditches, yellow roads and trenches preparatory to reproducing 20,000 acres of northern France as it appears today for the benefit of Uncle Sam's student aviators.

The first contingent of the fliers who are to complete their training there during the next few weeks arrived at Hempstead yesterday. It is expected that their numbers will be increased with the arrival of each train coming from Texas, Louisiana and other southern states in which there are aviation camps, as all are being emptied into the Long Island finishing school.

Before the close of the summer it is expected that Long Island will be one great training camp for fliers, with Hempstead Plains and its faithful reproduction of a section of northern France as its center. Spring and summer months will find Long Island the most nearly ideal spot in the United States for training, the experts declare, and the trainers expect to make the most of these months.

The section of Long Island being camouflaged as a French firing line will be used by the fliers for observation work, including aerial photography. From the point in the sky where photographs of enemy trenches usually are made in war time, it is said that the lines upon the ground will be identical with those to be seen in actual service on the other side of the Atlantic.

Books for Our Soldiers

Good books are urgently needed for our soldiers and sailors here at home in the training camps, on transports, in the navy and over seas in the trenches.

A fund of $1,700,000 has been raised by the American Library Association, to build and equip thirty-four libraries in the camps, to provide trained library service and to buy books. The service includes all Y. M. C. A., K. of C. and Y. M. H. A. huts, hospitals, Y. W. C. A. hostess houses, and many other distributing agencies. The work has grown wonderfully, and to supply the unexpectedly great demand for books and thriftily save the fund, the American Library Association calls for a Book Drive Week, March 18-23, for gifts of books from the people's own libraries.

These libraries need a wide assortment of good books—books of American history and biography, books about the war, about France and for learning French. Poetry is very popular and fiction is in constant demand. Thousands who do not know enough of our language to understand their officers' orders need books on learning English and simple books. Books in foreign languages, too, are greatly appreciated, for men of every nation are fighting in defense of our common country. Books of almost every kind are having a circulation almost unparalleled. Crowds of earnest young fellows who never read before are reading now. They are studying ambitiously to fit themselves for higher duties in service, to help win the war, and for their own advancement after the war. "It's a school!" cried one enthusiastic boy in khaki.

New York must find hundreds of thousands of books. Multitudes of good books that would be of the greatest service are standing unused on shelves in our homes. Others that are treasured would still be gladly given if the great need were known. Fiction is particularly acceptable, for though in less demand, the need of it is imperative to many a lonely fellow, and the funds of the American Library Assocation are restricted as far as possible to the purchase of more serious works and of scientific books, the latest editions of which alone have any value.

Kansas Aircraft Corporation Formed

A new corporation is to erect a factory in Kansas City for the production of aeroplane propellers. A site for the plant was purchased from the Auto Land Company, and the factory now located there will be converted within a few weeks. Mr. J. A. Fullerton, formerly general manager of the Automatic Bookkeeping Register Company, is financing the new corporation.

Bill to Commandeer Timber, Timber Lands and Lumber

The Military Committee on March 1 ordered a favorable report on the Chamberlain bill, empowering the President to commandeer timber, timber lands, and lumber for the use of the Army, Navy, Shipping Board, and the Aircraft Board. Director Gifford, of the Council of National Defense, was before the committee for two hours in secret session for the purpose of discussing progress in aeroplane construction and the supplies of spruce imber available for that work.

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WEEKLY

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Amendment to Cut Army Aviators' Pay Defeated

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VOL. VII NEW YORK, MARCH 25, 1918 No. 2

AMENDMENT TO CUT ARMY AVIATORS' PAY DEFEATED

THE proposed amendment to cut the aviators' pay has met the fate it deserved. It was defeated by the Committee on Military Affairs of the Senate on March 14th.

The Aero Club of America, representing the parents of the thousands of Army aviators under training and the Army and Reserve officers, presented the case for the Air Service. The Club found out that there was a misconception among Army officers, outside of the Air Service, and in Congress, regarding the dangers in aeronautics, and regarding the needs of aviators, and undertook to correct it, by presenting a formidable array of pertinent facts on the subject.

The case was so clear that most of the officers of other branches of the Army than aeronautics agreed that it would be unfair to cut the aviators' pay.

The amendment providing for the cutting down of the aviators' pay was part of Senate Bill 4013, introduced by Senator Fletcher in the Senate and by Congressman Dent, Chairman of the Committee on Military Affairs, in the House of Representatives.

The proposed amendment read as follows:

"Sec. 12. That all of paragraphs one and two of section three; that portion of paragraph three of section three reading 'each aviation enlisted man, while on duty that requires him to participate regularly and frequently in aerial flights, or while holding the rating of aviation mechanician, shall receive an increase of fifty per centum in his pay'; and that further portion of paragraph three reading: 'Provided further, That there shall be paid to the widow of any officer or enlisted man who shall die as the result of an aviation accident, not the result of his own misconduct, or to any other person designated by him in writing, an amount equal to one year's pay at the rate to which such officer or enlisted man was entitled at the time of the accident resulting in his death, but any payment made in accordance with the terms of this proviso on account of the death of any officer or enlisted man shall be in lieu of and a bar to any payment under the Acts of Congress approved May eleventh, nineteen hundred and eight, and March third, nineteen hundred and nine (Thirty-fifth Statutes, pages one hundred and eight and seven hundred and fifty-five), on account of death of said officer or enlisted man' of 'An Act to increase the efficiency of the aviation service of the Army, and for other purposes.' Approved July eighteenth, nineteen hundred and fourteen (Thirty-eighth Statutes, page five hundred and fourteen); all of section six, and that portion of section seven reading: 'Provided, That balloon mechanicians shall receive the same increase of pay as now prescribed by law for aviation mechanicians,' of 'An Act to authorize the President to increase temporarily the Signal Corps of the Army, and for other purposes', approved July twenty-fourth, nineteen hundred and seventeen (Public, Numbered Twenty-nine, Sixty-fifth Congress), and all other Acts and parts of Acts providing ratings as junior military aviators, military aviators, junior military aeronautics, and military aeronautics, and providing increased rank and pay for officers or enlisted men in the aviation section of the Signal Corps and porviding for any other increased pay for engaging in aerial flights, and porviding increased allowances to dependents of officers or enlisted men dying as the result of engagement in aviation be, and the same hereby are, repealed."

Following this action by the Senate Committee on Military Affairs, the following statement was issued on behalf of Secretary Daniels, who had also asked for the cutting down of the pay of aviators:

"Navy aviators hereafter will be required to make a certain number of actual flights to be eligible for the customary fifty per cent bonus in pay under regulations signed by Secretary Daniels today. The number of flights required was not made public.

"In announcing this new policy of the Department, Secretary Daniels said he had reversed his stand taken in a letter to the House Naval Committee recently, in which he recommended abolition of the bonus. This was due largely, he said, to the decision of the Senate Military Committee not to eliminate from the military bill allowance for a similar bonus for army aviators.

"As a matter of principle, I am still opposed to the bonus in pay for aviators," said Mr. Daniels, "but I am told that England maintains the practice, and now that the War Department's position in the matter has been settled it would not do for the Navy to take a contrary course.

"Another fact operating against a change is the number of men who have entered the aviation service under the impression that certain rates of pay would be received."

Mr. Daniels also announced that he recently had asked Congress not to act on his original recommendation for the elmination of the bonus for navy aviators unless similar action was taken with respect to the army. He suggested that the whole question be postponed until after the war."

DELAY IN AIRCRAFT PROGRAM MADE PUBLIC

FURTHER details of the delay in carrying out the aircraft program were made public on March 18, following consideration of the subject by the Senate. Several weeks before the publication of these details the subject was brought forcefully to the attention of President Wilson by the aeronautic authorities and prompt steps were taken to consider the whole subject and make plans for the possible extension of the whole program.

This work has been, and is being, done by several groups of officials and civilians. Some of the details regarding the delay in the aircraft program are given in the following statement printed in the New York *Times:*

"President Wilson has become so concerned over what has been told him of conditions affecting aircraft production that he has set to work a special committee, under the Chairmanship of H. Snowden, Marshall of New York, to collate the facts, with a view to remedying the deficiencies that have been discovered.

Walter S. Gifford, Director of the Council of National Defense, has been made Director of the Aircraft Production Board, a new office. The official announcement ,made on March 12, did not indicate how intimately Mr. Gifford's new position was connected with the revelations of aircraft delay.

"He will deal particularly," said the announcement, "with the problems of organization involved in the activities of this body in its advisory relations with the War and Navy Departments and with the industries involved in the Government program."

"The impression now prevails that the entire military aircraft program will be carried out under civilian direction.

"It is recognized that those with whom responsibility for aircraft production rests have not been entirely at fault. Collision between the aircraft interests and other Government activities in obtaining sufficient quantities of the necessary high-grade timber, labor troubles, the breakdown of transportation facilities, attributable in part to extraordinary weather conditions, the necessity for enlarging the number of cylinders of the Liberty motor to produce the best results in speed—these are some of the things that have caused the delay.

"But men in Congress who are anxious to win the war are alarmed at the condition concerning aircraft production of which they have been made aware. To the credit of some of those concerned in the administrative end of the program, it should be said that they have been frank and have not attempted to conceal the ugly facts. It is felt by some of those whose ideas of duty rises above all other considerations that a resumption of the investigation of the war administration by the Senate Committee on Military Affairs, with particular reference to the aircraft situation, would serve a good end, even if the widest publicity were given to the evidence of inefficiency or whatever it is that has produced the condition that made one Senator, after listening to testimony of how little had been done, put his head on the committee table and weep from disappointment and chagrin.

Situation Told to President

Revelations which led to the present effort to bring improvement were made to the Senate Committee on Military Affairs. On March 1 the committee held a meeting and decided that the delay in aircraft production was so serious that the matter ought to be laid before President Wilson. Some of the committeemen, expressed the belief that the President had been kept in ignorance of what the situation was. On the following day the information that the committee had obtained through an authoritative source was made known to the President, and it is believed that the changes ordered and in contemplation in connection with the failue of the construction program are the outcome of what was said to the President.

The delays in production affect bombing planes. There are plenty of training planes, and no complaint exists on this score. But bombing planes are urgently needed. The fact that General Pershing permitted correspondents of American newspapers with the American expeditionary forces to send dispatches referring to the disadvantage under which the American troops were placed by lack of aircraft carried a significance that was not lost on Washington. Dispatches of this sort were sent from the American front in France on several occasions. They pointed out that German planes flew over the American lines practically without interference.

"A much better relationship between the executive branch of the Government and that part of the legislative end having to do particularly with war measures was established when members of the Senate Committee on Military Affairs attended a session of the War Department's interdepartmental war council last week. It was felt that a new era in team work was beginning and that even the discouraging things learned at that joint meeting were in themselves encouraging in the frank willingness of Acting Secretary of War Crowell and the military officers present to tell the facts without concealment.

"At the same time the emissaries from 'the other end of the avenue'—the members of the Military Committee—found that what they had heard previously was little worse than the new information. They were told at the War Department that the aircraft program was 74 per cent behind, which was understood to mean that only a trifle more than one-fourth of the program of production set for this time had been carried out. What they had heard before they were invited to the War Department was that the percentage of production was lower. The exact figures of the number of aircraft planned for, promised under revised estimates and actually to be delivered within the specified time, and the percentages of production and delay, are withheld from this dispatch.

"The hope has been expressed here that by his personal visit to the American front in France and the opportunity to consult General Pershing and other officers Mr. Baker will learn intimately just what condition confronts our troops through the lack of aircraft and will be better prepared, when he returns home, to take steps to remedy the defects. A feeling exists that in applying the remedy some injustice may be done to men who have worked hard and faithfully, but whose accomplishments have not squared with promises and preliminary rata of a most impressive character.

"Every one here who is in touch with the enormous task that has confronted and is confronting the several branches of the Government engaged in war preparation realizes how much easier it is to criticize than to praise. There is a disposition among those so informed to give credit for overcoming the vast difficulities encountered.

"At the same time it is felt that fault exists somewhere with reference to the slowness of aircraft production."

Criticism along this line goes back to the old complaint of lack of co-ordination, of teamwork, at the top. The criticism would be less severe and the disposition to excuse more general if it had not been that everybody concerned, including Cabinet officers and members of the Military Committees of Congress, were led to believe that, whatever shortcomings in war work existed elsewhere, they did not apply to the program for giving the United States and its co-belligerents the mastery of the air on the French front within a short period."

Aero Club of America States Situation Can Be Saved by Appropriation of $3,000,000,000

THE aircraft situation was discussed at a special meeting of the Executive Committee of the Aero Club of America on March 19. Officials of the Club were asked by the Government several weeks ago to give their advice in speeding up the aircraft program, and an exhaustive report was prepared on request, giving every aspect of the situation.

The officials of the Club would not discuss this report, nor the reported shortcomings or mistakes of men connected with the conduct of aeronautic affairs in Washington or elsewhere.

The following statement was issued after the meeting of the Executive Committee of the Club:

"The situation has many different aspects and it takes people who are familiar with aeronautics and with the military and naval situation in Europe and can give from twelve to sixteen hours a day to the subject to consider every angle without losing themselves in the maze of purely technical details and becoming confused.

"The situation must be considered from the standpoint of whether we as a nation are today going as far and as fast as we can with the aircraft program, and whether the present program is sufficient to insure the constant production of aeroplanes in sufficient number to supply the American aviators in France, train and equip the thousands of aviators under training and to be trained, and contribute to the building of the Allies' forces, so as to gain and maintain the Allies' supremacy in the air.

"If we look at the situation from this standpoint we find that they are only doing one-fifth of what we should do and the main reason is that there are no funds with which to do more. The Government aeronautic organization today is unable to go further essentially because it lacks funds.

"The present aircraft program was made at the time when Italy was victorious and Russia was still fighting energetically. The $640,000,000 appropriation represented the rock bottom minimum cost for the smallest plan that could be made to meet the situation successfully then. It did not allow a margin to take care of changing conditions, and meet unforeseen needs.

"The Italian reverses and the Russian collapse created new conditions, to meet which, we should immediately have tripled our aircraft program. The Club officials consulted some of the authorities about it and found that they felt the same way. But Congress was not in session, and nothing could be done, outside of making plans.

"These plans were made public in part when the War Department made public the fact that the estimates include an item for pay of 11,941 aviation officers and 153,945 enlisted men for the Aviation Section of the Signal Corps. As it takes an average of two aeroplanes to train each aviator to the high point of efficiency required today, and then it takes a minimum of six aeroplanes per aviator to keep him fighting for a year, and it takes a spare motor for every motor used, there would be required 80,000 aeroplanes and more than twice that number of motors. Also a much larger number of schools for aviators and mechanics than there are now.

"To carry out this program would take an appropriation of about $3,000,000,000, or about five times the amount the authorities have had to work with.

"This is a large sum, but it is small compared with the cost of the war, which is about $500,000,000 a day, including economic loss due to cessation of commerce, and the enormous destruction of life and property.

"The Aero Club of America officials went over these figures with different Government officials and they agreed that such a program was necessary—and they felt that Congress would give the necessary appropriations soon after convening.

"This has not yet been done and the Government aeronautic organization's hands are tied until Congress allows further appropriations.

"Provided ample funds are allowed, the situation can be saved even at this late hour and the production of aircraft, motors, and equipment quadrupled in the coming few months—there being a substantial foundation to build on."

THE NEWS OF THE WEEK

Baker Arrives in France

Newton D. Baker, the Secretary of War, has arrived safely at a French port en route to the headquarters of General Pershing, on an important tour of military inspection and conference.

Pennsylvania Aero Club Opens New Library

The Aero Club of Pennsylvania has opened a library at 717 North Broad Street, Philadelphia, where the Y. M. C. A. Aeroplane Mechanics School is located.

The Club was consulted by the Post Office Department regarding the location of the landing place for the new Aerial Mail Route. League Island Navy Yard was designated as being the most suitable, but on further investigation it is found that another site must be selected.

The members of the Club will be the guests of the Engineers' Club when Mr. Howard E. Coffin, the Chairman of the Aircraft Board, delivers his address on "Aeroplanes in the War."

With Our Aviators "Over There"

Thomas Hitchcock, Jr., of Westbury, L. I., serving in the Lafayette Escadrille, disappeared while pursuing an enemy plane over the German lines. A cable later received states that Hitchcock had been captured in Germany and was unhurt. Although only seventeen and on the front but two and a half months, Hitchcock has downed three German planes, two of which he destroyed in one day, and has been awarded the Croix de Guerre.

W. C. Winter, Jr., of Chicago, also with a French aviation corps, was killed in an aerial fight, and fell within the German lines.

Sergeant Wellman, of Cambridge, Mass., serving as an aeroplane pilot is credited with having shot down two German machines on one afternoon. He is a volunteer with the French Aviation Corps.

First Lieut. Robert M. Olyphant, Jr., is now on the French Front. Lieutenant Olyphant was one of those who took up aviation as a member of the First Aero Company, the training of which was paid for at private expense under the auspices of the Aero Club of America. Robert Olyphant, Jr., is a graduate of Yale University, and a member of the Aero Club of America.

At the suggestion of a member of the St. Albans Committee for the sale of War Bonds, an American aviator flew to Childwickbury, the residence of the well-known financier, Jack Barnato Joel, with an application form inclosed in an envelope and weighted with lead. Swooping low he made an excellent drop, and delivered the letter practically on the front doorstep. Mr. Joel responded, and that night sent a check to the St. Albans Association for £25,000.

A two-seater German aeroplane engaged in carrying out observations over the American lines north of Toul was shot down by French anti-aircraft guns on March 10th.

The aeroplane struck the earth near the American first line trenches, falling into a shell crater which caused it to overturn, hiding the big black Maltese cross, the insignia of German aircraft.

There was much air activity all day Sunday and the troops saw many thrilling contests, but found it hard to distinguish between friend and foe, so great was the altitude.

An American aerial observer, in a French aeroplane crossed the German lines on March 14th at a low altitude and used his machine gun effectively on the second line. Other Americans were in the air all day, many over German territory.

One aerial battle is reported. The American observer emptied a gun at a German plane, but without apparent result, as the enemy was hurrying toward the rear. Another machine in which American observers were manning the guns went up to meet German aeroplanes, which had crossed the lines, but failed to get close enough to shoot with any chance of scoring a hit.

Paul Frank Baer, member of the Lafayette Escadrille since January, 1917, brought down his first German aeroplane. Baer served with the Pershing expedition before he joined the Frnch service.

Arthur W. Woods, former police commissioner of New York City, is now a lieutenant-colonel in the Aviation Section

Survey Committee Named on Aeronautical Work

The War Department authorizes the following:

In line with the general policy of the Secretary of War to keep thoroughly advised of the detail workings of the various departments of the Government and with the industrial conditions involved in the consummation of the various war programs, announcement is made of the appointment of a committee consisting of Mr. Snowden Marshall, of New York; Mr. Edward Wells, of the Babcock & Wilcox Co.; and a third whose name will be announced later.

This committee will make a broad survey of the Government aeronautical program with particular relation to the industrial phases of the work.

It is felt that the advice of this committee will prove of the greatest aid in pushing the development of the air service.

Castor-Oil Seed in Italy

Consul Honey, at Catania, Italy, reports: The minister of agriculture has made an appeal to the Province of Catania to take up the cultivation of ricinus (castor-oil seed). The ministry will furnish the seed and will buy the shelled product at 250 lire and the unshelled at 160 lire per quintal. The quintal is 220 pounds and in normal times the lire is worth $0.193. The oil is to be used for the Government's aviation machines.

Liberty Motor for Seaplanes Proves Success

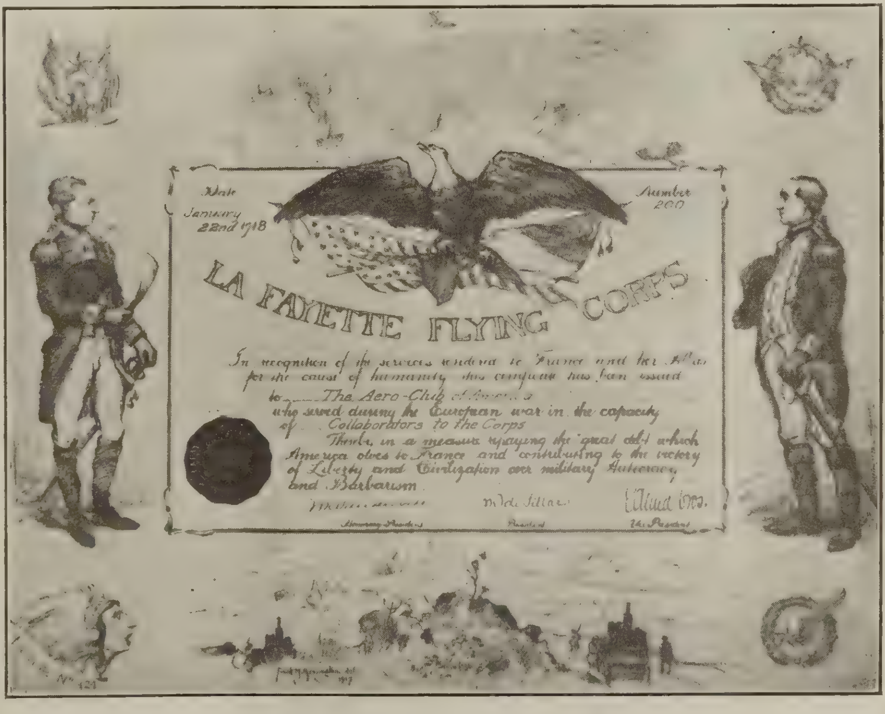
America's first fighting seaplane equipped with Liberty motors has been tried and accepted. A number of the craft are now being delivered for the use of the Naval Air Service. They are the advance guard to a big fleet which will be added to the forces engaged in submarine hunting in the war zone.

A second type of fighting plane for the American army, known as the Bristol model, also has now reached the production stage and a considerably number will become available during the present month. Still another type, a two-seated machine is being constructed.

Navy Aviators Will Continue to Get Bonuses

Navy aviators hereafter will be required to make a certain number of actual flights to be eligible for the customary fifty per cent bonus in pay under regulations signed by Secretary Daniels. The number of flights required was not made public.

In announcing this new policy of the department Secretary Daniels said he had reversed his stand taken in a letter to the House Naval Committee recently, in which he recommended abolition of the bonus. This was due largely, he said, to the decision of the Senate Military Committee not to eliminate from the military bill allowance for a similar bonus for army aviators.



Date
January
22nd 1918

Number
200

LA FAYETTE FLYING CORPS

In recognition of the services rendered to France and her Allies for the cause of humanity this certificate has been issued to The Aero-Club of America who served during the European war in the capacity of Collaborators to the Corps

Thereby, in a measure repaying the great debt which America owes to France and contributing to the victory of Liberty and Civilization over military Autocracy and Barbarism.

Honorary President — President — Vice President

The Aero Club of America is proud of this certificate presented by the Lafayette Escadrille in recognition of the service it has rendered aviation.

Air Police for New York City

As a part of the newly organized police reserve, formerly the Home Defense League, of which Rodman Wanamaker, Special Deputy Police Commissioner, is to be the head, there is to be organized a division of air defense, according to reports current at Police Headquarters. The police reserves, if the reports are accurate, also will include a mounted squad and a harbor squad, in addition to the regular reserve patrolmen with their olive drab uniforms and campaign hats.

Police officials declined to comment on the new organization, but from conversation with several who have been conversant with the plans it was learned that Commissioner Wanamaker is highly enthusiastic over the proposal to develop police aviators. It is expected that the mounted part of the police reserve will be drawn from those who own riding horses, while the harbor squad will be made up of those who own motor boats.

Non-Flying Units at Full Strength

Sufficient recruits have been obtained for the non-flying units of the aviation corps and the War Department ordered recruiting stations to discontinue temporarily accepting men for this service. As soon as additional units are organized recruiting will be resumed.

Bristol-Curtiss Aeroplane has Successful Test

The Bristol-Curtiss fighting biplane, equipped with a Liberty motor, was given a successful test at Curtiss Field, Buffalo, N. Y., recently. Quantity production of the aeroplane, with slight changes in construction, will be under way this month.

Lieut. Nungesser Now French Aviator Idol

Lieut. Nungesser, who became the French "ace of aces" after the death of Capt. Guynemer, has just brought down his thirty-first enemy machine, according to a news dispatch.

News of his latest exploit is hailed with delight by the French press, because it comes after months of comparative inactivity on his part, during which he has been recuperating from effects of serious injuries received in an automobile accident.

Nungesser's ability as an aviator, coupled with his many injuries and remarkable recuperating powers, is gaining for him the title of "superman."

He has been repeatedly injured, and twice French physicians have classified him as "unfit for further service," but his robust constitution and strong will power have enabled him to overcome all obstacles, and he has steadily found his way back to the escadrille.

During one of his periods of "convalescence", at Dunkirk he brought down nine enemy machines.

Lieut. Soulier, Veteran French Ace, Arrives to Instruct American Troops

Lieutenant Constant Soulier, a French ace, with fifteen German aeroplanes to his credit, has come to the United States to assist in the theoretical and practical insruction of flyers of the American air forces, preparatory to service abroad.

For more than two years he has been in the French Flying Corps and of late has been attached to the Twenty-sixth squadron. He has fought in many sectors.

Lieut. Dodge to be Sent to France

Lieut. Percival Dodge, a prominent member of the Aero Club of America, and long known for his enthusiasm for aviation, is now awaiting orders to proceed to France to join the American flying forces on the French front. Lieutenant Dodge gained his commission as an expert aviator some time ago. After training at Miami, he was sent to the Washington Aviation Section, and is now awaiting final orders.

Lieut. Dodge is a graduate of Yale University. His two brothers are serving in France, one with the American ambulance and the other with the American Distribution Service.

Johns-Manville Erects New Building

The H. W. Johns-Manville Company has erected a modern fireproof building in St. Louis, constructed as far as possible of Manville products. Comfortable arrangements are provided for employees and the building affords excellent facilities for displaying the extensive line of Johns-Manville Asbestos products.

Donald McGee, Civilian Instructor Has Fatal Accident

Donald McGee, identified with aeronautical activity, since his boyhood, met with death at Selfridge Aviation Field recently. At the outbreak of the war he endeavored to enlist in the Aviation Section, but owing to a serious operation, he was rejected. He was, however, accepted as a civilian instructor, and was killed in the performance of his duty at Selfridge Field.

Mr. McGee constructed his first successful aeroplane at the age of nineteen. He was elected a member of the Aerial League of America just prior to his unfortunate accident.

Miss Katherine Stinson, who holds the American duration record for women aviators.

Urgent Deficiency Bill Largest in Our History

The principal appropriations in the bill, as increased by the Senate, include:

Army	
Supplies	$28,358,000
Transportation	125,000,000
Storage and shipping facilities	150,000,000
Barracks and quarters	67,250,000
Military posts, water and sewer systems	20,180,000
Hospitals	21,270,000
Engineer field operations	70,000,000
Ordnance stores	257,000,000
Ordnance manufacture and purchase	34,000,000
Artillery	114,000,000
Temporary office building	5,775,000
Additional employes	4,470,000
Navy	
Ordnance	10,000,000
Washington gun factory	5,499,000
Yards and docks	6,144,000
Hospital construction	7,750,000
Training camps	12,000,000
Ordnance stations	2,500,000
Miscellaneous	
Fuel and food administrations	1,750,000
War Trade Board	1,018,000
State Department emergencies	300,000
Bureau of Risk Insurance	1,537,000
Enforcement of the espionage act	300,000

U. S. Standardization Board Now in London

The members of the American Standardization Board, who are now in England, were the guests of honor at a reception given by their English colleagues. Among those present were Winston Spencer Churchill, the minister of munitions, and prominent British engineering experts. Speeches were made by Colonel Churchill, F. G. Diffin, and Andrew Weir, and representatives of France and Italy.

Colonel Churchill, in discussing air raids, said that allied superiority in the air is shown by the ease with which allied airmen continually bomb interior German towns in broad daylight, while the Germans only are able with difficulty to reach English and French cities at night.

Mr. Diffin described the present war as one in which 85 per cent, depended upon industrial effort and 15 per cent on military effort. He declared the secret of victory was to combine these two with 100 per cent efficiency.

Los Angeles to Have Government Flying Field

It was announced by Representative Randall of California that he had information from the War Department that a large balloon training station is to be established at Arcadia, about twelve miles east of California on the famous Lucky Baldwin ranch. This ranch comprises 17,000 acres and is widely known in sporting circles by the number of thoroughbred horses from there which have won racing honors.

There has not been any official announcement from the War Department regarding the approval of this field.

School of Aerial Photography Already in Operation

The U. S. Army School of Aerial Photography opened at Kodak Park, Rochester, N. Y., with an enrollment of 560 students. The first week's instruction will consist of military drill and lectures on military matters. Instruction in photography will begin in about two weeks.

Aerial Mail Service Postponed

The aerial mail service which was to be inaugurated on April 15th, has been postponed to May 1st, owing to the delay in the selection of a suitable landing place. It was proposed to use League Island Navy Yard at Philadelphia, but the Post Office Department was recently informed that it would not be available.

The present requirements for a landing place are an area of about 2,000 square feet. The Post Office is working on the development of devices to permit the starting and landing of aeroplanes on a much smaller field. Satisfactory progress is reported.

New Pastime for Allied Flier on Mount Olympus

Eagle hunting is a casual pastime for at least one Allied aviator. Flight Captain Mortureaux of the French Salonica army shot two while flying near Mount Olympus. He landed, secured the game, and returned to his hangar with it.

House Increases Naval Aviation Appropriation

During the consideration of the Naval Appropriation Bill, the House Naval Committee increased the item for naval aviation from $91,000,000 to $188,000,000.

Liberty Motor Production

To Liberty aeroplane motor production will soon be proceeding at a rate of 300 per day from five specially designated automobile and aeroplan factories. The Ford Motor Co. will produce 100 a day, Packard Motor Co., Harmon Co., Lincoln Motors Co. and the General Motors Corp. 50 per day. The greatest production is expected to be attained early this summer, according to "Automotive Industries." The type now being produced in the greatest number is of 12-cylinder type, 450 h.p. developing 1 horsepower to each 2 lbs. of weight.

Wright-Martin to Make Complete Planes

The Wright-Martin Company has been concentrating on an order of Hispano-Suiza motors, and has been turning out 10 per day. It is soon to take up the production of complete aeroplanes. It is understood the company is negotiating for 25 machines to be built at its Pacific Coast plant.

According to "Automotive Industries", 500 of the 150 h. p. Hispano-Suiza motors have been delivered. The Company now working on contract for 3,000 motors of the 300 h. p. type.

Army Spruce Division Ends Competition

Competition between large concerns seeking to supply the Government with aircraft spruce has been eliminated by an agreement reached by representatives of the companies in conference with Colonel Brice P. Disque, commanding the spruce production division of the Signal Corps.

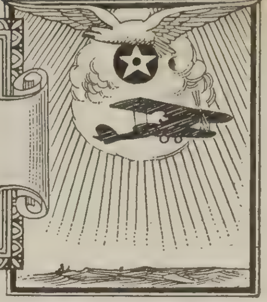
The Aeroplane Spruce & Lumber Co., of Hoquian, has been assigned to Grays Harbor country.

The Warren Spruce Co. of Portland, has been assigned to the Siletz basin and the Alsea bay district and a portion of Grays Harbor Country.

The Grant-Smith-Porter Brothers Co., of Portland has been assigned the Southern portion of Pacific Country and unassigned portions of Oregon.

The keen competition between these three principal companies threatened to result in reduced output, and hence Colonel Disque took steps to end the bitter rivalry.

NAVAL *and* MILITARY AERONAUTICS



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
EHT—Report to Ellington Field, Houston, Tex.
ELA—Report to Eberts Field, Loanoke, Ark.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
THT—Report to Taliaferro Field, Fort Worth, Texas (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1. Report to Signal Corps troops, Waco, Tex.

Note 2. Report to Camp Funston, Kans., for duty as chaplain.

Note 3. Report to commanding general, Hoboken, N. J.

Note 4. Report to Montgomery, Ala.

Note 5. Report to district manager of inspection, Detroit, Mich.

Note 6. Proceed to New York, N. Y.; Cambridge, Mass.; and San Diego, Cal., for temporary duty, then to Kelly Field, San Antonio.

Note 7. Report to First Lieut. F. G. White, 870 Woodward Ave., Detroit, Mich.

Note 8. Proceed to Boston, Mass., for duty with Board of Officers.

Note 9. On completion of duty, report to Langley Field, Hampton, Va.

Note 10. Proceed to Los Angeles, Cal., then to Sacramento, Cal.

Note 11. Report to Capt. James S. Heaslett, 870 Woodward Ave., Detroit, Mich.

Note 12. Proceed to Long Island City, N. Y.

Note 13. Proceed to Cleveland O., and then to New York, N. Y.

Note 14. Report to Capt. Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 15. Proceed to Washington, temporary duty, then to Taylor Field, Montgomery, Ala.

Note 16. Report to places named for temporary duty in the order listed.

Note 17. Report to Camp John Wise, San Antonio, Tex.

Note 18. Report to Major Sheppler, 1836 Euclid Ave., Cleveland, O.

Spècial Orders Nos. 50 to 58, Inclusive

A

Allen, William R.	SLR
Allen, Paul V.	SLR; RSD
Allen, Albert Delos	SLR; EHT
Atchison, Thomas Calvin	SLR; THT (1)
Arzee, Paul Thomas	SLR; SBI
Akers, Harry Albert	SLR; RWT
Alvey, Aloysius B.	PFO
Abbott, Leonard L.	SLR
Angell, Cyril Matthew	SLR;THT
Austin, Fred	SLR; GLC
Abernethy, Thomas James	SLR; THT
Arthur, Eber Oscar	SLR; MSC
Arnold, Arthur Trumbo	RSD
Axley, Seth	SLR
Aldrich, Harry Starkey	SLR; RSD
Abney, Louis D.	FRF
Allen, Morton P.	SLR
Aaron, Robert L.	SLR
Asche, Harry P.	FRF
Anderson, Samuel H.	SLR
Andrews, Clifford S.	FLR
Allsopp, Clifford W.	FLR
Aman, Herbert L.	FLR
Alexander, Harold F.	FLR
Anderson, Richard F.	Note 17
Ashton, Thomas H.	Note 17
Allen, William Richard	SLR; FOB
Adams, Cedric S.	MSC

B

Bell, William P. B.	FRF
Buck, Walter F.	FRF
Bennum, Chauncey H.	FRF
Burdick, Howard	SLR; THT (1)
Butler, Joseph Francis	SLR; LHV
Benson, Albert Thurston	SLR; SBI
Bollman, Henry	SLR; SMM
Biddle, Craig	SLR; SBI
Bucklin, Paul D.	SLR; SBI
Broadlick, John N.	FLR; CDT
Butthick, Alden Crippen	SLR; CAF
Bijur, Harry	SLR; KST
Bierer, John Edward	SLR; SBI
Brooks, Martin V. B.	SLR; CSO
Belser, George N.	FRF
Bales Harry O.	FLR; CDT
Bischoff, Henry William	SLR; MSC
Bradley, Charles Emmett	SLR; EHT
Bannister, Cylde Eugene	SLR; EHT
Bush, Roland Allen	SLR; THT
Babcock, Howard Orville	SLR; SMM
Buckley, Charles Joseph	SLR; EHT
Bodenheimer, Bertram	SLR; CGC
Bocker, Leon Morris	SLR; EHT
Boudwin, Joseph Ellwood, Jr.	SLR; THT
Brooke, Boone Winthrop	SLR; EHT
Bower, Paul Eugene	SLR; THT
Badenhausen, William Carl	SLR; KST
Bronson, Tyler Cook	SLR; THT
Bigelow, Joseph Smith, Jr.	SLR; CMV
Bryan, Mahlon Philip	SLR; THT
Bogert, Edmund Archibald	SLR; THT
Bandy, Russell McLin, Jr.	SLR; GLC
Brotherton, William Edgar	SLR; THT
Bunnell, Miron	SLR; LDT
Bowyer, James Ernest	SLR; THT
Burge, Edwin	FRF
Block, Hyman, Jr.	SLR
Blackburn, Ernest W.	PFO
Barr, David W.	SLR
Binks, Albert E.	SLR
Black, Craig O.	SLR
Bowen, Raymond B.	SLR
Brooks, Arthur H.	SLR
Bruce, Joseph W., Jr.	FRF
Barlow, Stephen Morris	TMA
Buffum, Warren Hodgton	RSD
Bartholemew, Robert	CAF
Buchanan, James P.	DIK
Bell, George Edward	DIK
Bingham, Halsey L.	RSD
Behncke, David L.	SLR
Bowen, Claude M.	SLR
Boyd, John P.	SLR
Burr, Richard Olcott	DIK
Brackett, Ray	SLR
Brown, Edwin Arnold	SLH; EHT
Baker, Richard W.	SLR
Burke, Thomas R.	SLR
Beehler, Charles H.	SLR
Bentley, Frank H.	SLR
Belding, Hiram, Jr.	SLR

Bigelow, James L.	SLR
Burkholder, Albert N.	SLR
Bruton, David D.	FRF
Barber, Newell Clarence	SLR; RSD
Brodersen, Leroy	SLR; RSD
Berry, Clarence John	SLR; MSC
Briggs, Elmber J.	FLR
Blackmore, William Cameron	SLR; RSD
Bell, Frederick Drake	SLR; MIT
Beij, Karl Hilding	SLR; MSC
Bailey, George Bradner	SLR; RSD
Brenneke, Augustus Martin	SLR; DIK
Beckley, Henry A.	FLR
Bauer, Edward H.	FLR
Burgess, George H.	BST
Bogert, Gilbert P.	FLR
Beach, Arthur M.	FLR
Benson, John A.	FLR
Bensinger, Floyd A.	FLR
Bass, Carl R.	SLR
Ball, Lionel E.	SLR
Bostick, Bonham H.	FLR
Brewster, Sydney E.	FLR
Baird, John A.	FLR
Bonney, Ulysses H.	Note 17
Burnham, Samuel P.	WSC; Note 10
Bryan, George	Note 13
Bryant, Frank A.	EV; Note 18; WCS
Beers, George M.	FLR
Bowen, Claude Morris	SLR; EHT
Brindley, Oscar A.	GLC; EHT; RSD; Note 16
Boyd, John Peebles	SLR; RWT
Brown, George L.	SLR
Butler, William H., Jr.	SLR
Bailey, Elmer S.	SLR
Bradford, George L.	SLR
Barcelo, Louis A.	PMT
Behncke, David L.	SLR; PMT
Barrows, Wesley Earl	RWT
Bovey, Sidney John	GLC
Brackett, Roy	SLR; FOB

C

Cook, Charles C.	FRF
Crane, Lester S.	FRF
Cowan, Royal Wesley Burnett	SLR; LDT
Coleman, Loring Wilkins	SLR; SBI
Chamberlain, Rowland Lee	SLR; EHT
Charnley, William Slater	SLR; EHT
Coker, John James	SLR; EHT
Clark, Ralph Nathaniel	SLR; CRI
Cochran, Robert J.	FLR; AGC
Cunliffe, William Henry, Jr.	SLR; EHT
Connell, Samuel Martin	SLR; EHT
Cahall, Ralph J.	FRF
Chrisite, Edward H.	SLR
Clark, Clifton W.	SLR
Chase, Samuel W.	FRF
Colby, Orville Theodore	RSD
Coney, William D.	FRF
Comstock, Keyon P.	FRF
Culley, Oscar L.	EHT
Chandler, Lane T.	FRF
Cameron, Allan John	LR; WDO
Clyde, Robert William	SLR; CWT
Coates, Austin Murry	SLR; CWT
Carlson, Hilding Nathaniel	CSO
Collett, William Barrow, Jr.	SLR; THT
Croxford, Frank Denny	SLR; RSD
Cunnius, Percy Eugene	SLR; THT
Cogan, William Joseph	SLR; THT
Cross, Price Emerson	SLR; THT
Crawford, William John	SLR; THT
Cooper, Ralph E.	PFO
Cornell, Frank B.	SLR
Cohen, Victor H.	SLR
Carpenter, Arthur E.	SLR
Coates, Austin M.	SLR
Cohen, Jacob	SLR
Cronk, Elton F.	SLR
Caldwell, Robert M.	FRF
Coyne, Frank Patrick	KST
Carruthers, William H.	RRC; WCS
Chapman, Norvell P.	DIS
Curran, James Martin	SLR; KST

William E. Dugan, Jr., of Rochester, N. Y., one of the few remaining members of the Lafayette Escadrille.

Cudworth, Roger L.	RRC
Clayton, George W.	OSU
Consolley, Leon Leslie	SLR; DIK
Clapp, Robert P.	SLR
Colthart, Robert L.	SLR
Connolly, William E.	SLR
Crowe, John R., Jr.	SLR
Changnon, Dale A.	SLR
Christian, Clarence H.	SLR
Chrisitan, Carleton W.	SLR
Cole, Charles C.	SLR
Clark, William H.	SLR
Christie, Edward M.	SLR; EHT
Clayton, John H.	FRF
Crawford, William J.	FRF
Cabot, Thomas D.	FRF
Clement, John B., Jr.	CPR
Childs, John S.	SLR
Clarkson, John W.	SLR
Coad, Ralph G.	SLR
Cooper, Frederick A.	SLR
Culbertson, Robert A.	SLR
Cunningham, William N.	SLR
Cordes, Walter W.	FLR
Cahill, Matthew L.	FLR
Cohen, Victor Herbert	SLR; RSD
Curry, Howard S.	CPR
Collier, David Copely	SLR; KST
Chandler, Hugh C.	CPR
Chase, Paul Weaver	SLR; RSD
Carhart, Harold W.	SLR
Crosthwaite, Robert O.	SLR
Cupp, Robert O.	SLR
Curry, James T., Jr.	SLR
Carlson, Leonard H.	CPR
Cross, Robert P.	FLR
Cummings, Lester E.	CPR
Crawford, Henriques	FLR
Changnon, Sale Andre	SLR; EHT
Colthart, Robert Louis	SLR; FOB
Christian, Clarence Herbert	SLR; RWT
Clark, George Sawyer	DIK
Crowe, John Robert, Jr.	SLR; FOB
Cathcart, Sewall C.	SLR
Claghorn, James L.	SLR
Colville, Clifford J.	SLR
Curtiss, Frederick W., Jr.	SLR
Cole, Charles Clayton	SLR; RSD
Christian, Carleton Wade	SLR; RWT
Clark, William Henry	SLR; GLC
Clapp, Robert Parker	SLR; FOB
Cheney, Christopher A.	FLR
Connolly, William Edmund	SLR; FOB
Carr, John P.	SLR
Corey, Joseph G.	SLR
Clark, C. W.	SLR; MIT

D

DeFrance, Smith J.	FRF; SLR; THT
DeShields, Charles Burton	SLR; GLC
Donoho, John Frederick	SLR; THT
Dorland, Carl C.	SLR; RSD
Denny, Harmar Denny, Jr.	SLR; GLC
Dennie, Norvell Wallace	SLR; CWT
Donaldson, John S.	SLR; CWT
Dwiggins, Russell Harrison	SLR; EHT
Doehler, Herbert Herman	SLR; THT
Dean, Alexander Richard	SLR; THT
Deering, William Fulton	FLR; PFO
Dinger, Harry Arden	RSD
Dodds, Hiram E.	PFO
Dalton, Wilfred	SLR; DIK
Dunlap, Edwin W.	REL; CSO
Davis, Paul O.	FRF
Dimmick, Harold Edgerton	SLR; LDT
Derge, David R.	SLR; THT
Dost, Charles Otto	EHT
Day, Ezra Halsey	SLR
Dempsey, William L.	SLR
Dole, Eleazer J.	SLR
Dunning, Norman	SLR; EHT
Dailey, Gardner A.	SLR
Dale, Russell R.	SLR
Davis, Harold F.	SLR
Dearden, James R.	SLR
Dayton, Frank E.	SLR
Douglas, Charles	SLR
Dorsett, Walker C.	FRF
Dale, Russell Reynolds	SLR; THT
Dailey, Gardner A.	SLR; RSD
Dunlap, James E.	CPR
Dight, Frederick B.	SLR
Davis, Harold E.	SLR; CWT
Donaldson, John S.	FLR
Duncan, Claud E.	FLR
Daniels, Donald P.	FLR
Dissette, John W.	KST
Dunlap, Edwin W.	Note 3
Deeves, Edwin P.	SLR
Doutt, Robert H.	SLR
Dunn, Valentine F.	SLR
Douglas, Charles	SLR; RSD
Davis, Louis E.	SLR
Dudley, John E.	SLR
Dayton, Frank Elmer	SLR; RSD
Dearden, James Rowland	SLR; FOB
Davis, Raymond E.	DIK
Daniell, William I.	DIK

E

Estill, Frank Sexton	FLR; KST

Watching the manoeuvres of pilots in training for combat service. Sopwith tractors ready for flight. British Official Photo.

Eyrick, Harold R	TMA
Eldred, Warren B.	SLR; KST
Eckman, Murray Harrison	PFO
Erickson, Arthur E	SLR; PFO
Ellis, John DeMess	SLR; SMM
Eckert, William H	SLR
English, Alpheus T	SLR
Eaton, Samuel C., Jr	SLR; DIK
Epstein, Walter J	SLR; RSD
Evans, Russell E	SLR; THT
Eubank, Eugene L	FRE
Engsberg, Ralph William	SLR; MSC
Elliot, William, Jr	SLT; CDT
Edwards, Carl William	DIK
Elliot, Hammitt K	SLR
Eckerson, Gilbert H	CPR
Emmerich, Edmund M	LDT
Ebner, Gerald L	SLR
Elwell, Charles C., Jr	SLR
Edwards, Charles	CPR
Elliott, John J	FRF
Ervin, Robert J	UTA
Elwell, Russell T	SLR
Evans, Brinkley	SLR
Earle, Marion M	SLR
Easley, Sam A., Jr	SLR
Elliott, Hammitt Kenneth	SLR; RSD

F

Franklin, Elbert W	FRF
FitzSimmons, Richard A	FRF
Forrest, Charles R	RWT
Frankenberg, Edward Sylvester	SLR; LDT
Frost, Edward Prascey	SLR; LDT
Foddy, Howard Kenneth	SLR; DIK
Floyd, Robert K	FRF
Forshey, Fred William	SLR; EHT
Fox, EDWIN DANIEL	SLR; MIT
Fisk, James Kennett	FLR; CSO
Freeman, Maurice James	SLR; SMM
Fitzkee, Adam Hastings	SLR; THT (1)
Flaherty, Thomas A., Jr	PFO
Frobisher, Joseph Edwin	LR; THT
Flachsenhar, Walter R	SLR; RSD
Fahrney, Ira S. P	SLR
Fort, Frank B	SLR
French, Samuel B	AGC
Floyd, Ralf A	SLR
Foster, Harry	FLT; CDT
Frost, Ezra R., Jr	DIK
Fantham, Murray C	SLR
Finnell, Samuel C	SLR
Folsom, Frank G	SLR
FitzGerald, George F	SLR
Ferguson, William W	SLR
Fort, Frank Burwell	SLR; KST
Fearn, Irving K	FLR
Fahrney, Ira Samuel Peter	SLR; CSO
Fallot, Norman E	FLR
Fitch, Willis S	FLR
Freeman, Talbot O	FLR
Fishback, Leland K	SLR
Folsom, Frank Grover	SLR; FOB
Finnell, Samuel Cochran	SLR; FOB
Fantham, Murray Charles	SLR; LDT
Ferris, William Ray	DIK
Floyd, Ralf Albert	SLR; RSD
Fallon, Francis I	SLR
Farr, Newton C	SLR
Fletcher, William R	SLR
Fowler, Lee T	SLR

G

Gambie, Thomas Seward	SLR; CWT
Graham, Palmer H	FLR
Golden, Robert James	RWT
Garlough, John L	SLR
George, Abram	SLR
Greene, Calvin W. D	SLR
Greenslade, Russell M	SLR
Gardner, Lester D	CSO
Gottlieb, Edwin A	FLR; CSO
Garoni, Rudolph	SLR; GLC
Grant, Duncan Ross	SLR; THT
Gilbert, Clarence J	KST
Guernsey, Lucius Warren, Jr	SLR; THT
Gallagher, Robert T	SLR
Grove, Robert E	SLR
Grayson, L. Ayres	FRF; SLR; THT
Grantham, Guy E	MSC
Gauntlett, John McGraw	SLR; SMM
Gibson, Norman W	SLR
Gape, Leo B	REV
Geiger, William D	CSO
Gibson, Peyton	DIK
Greer, John E	SLR
Gouse, Frederick M	CSO
Giroux, Louis A	SLR
Grove, Robert E	SLR; CWT
George, Abram Nute	SLR; RSD
Greene, Calvin William Dewey	SLR; RSD
Gallagher, Robert Townsend	SLR; KST
Greenslade, Russell Molland	SLR; THT
Grace, Morgan H	OSU
Garlough, John Lawrence	SLR; RSD
Gober, James L	SLR
Garver, Chauncey B	SLR
Goetz, Norman S	SLR
Gilmore, Eugene W	FLR
Graham, Percy W	FLR
Grayson, L. A	FRF
Garland, Claud B	CPR
Gillett, Mellville	Note 3
Grey, Schuyler E	FLR
Carpenter, Wallace H	FLR
Griffin, Bennett H	FLR
Guest, David P	CAF

A Rumpler aeroplane captured on the Oise front. French Official Photo.

Greer, John Edward	SLR; GLC
Geisse, John H	SLR
Gilman, Arthur R	SLR
Goldsborough, George J	SLR
Goodwin, Thomas G	SLR
Grassi, Waldemar H	SLR
Giroux, Louis Aime	SLR; FOB
Gothlin, Oliver P	DIK

H

Hollingsworth, Frank Emison	SLR; EHT
Harris, Alexander H	SLR
Humphrey, Kenneth B	SLR
Husted, Merle Raymond	SLR; KST
Hinckley, Frederic Gray	SLR; LDT
Herrick, Geradius Post	CPR; DIK
Huebner, Herbert Carl	SLR; THT
Howlett, Robert	CMV
Hale, James	SLR; AGC
Hughes, Joseph W	SLR; AGC
Hartle, Russell P	PFO
Hageubuch, Rea Isiah	SLR; THT
Hynes, Thomas V	SLR
Hayden, Arthur Louis	SLR; GLC
Hall, Lysle George	SLR; THT
Higbie, Harley G	SLR; GLC
Hamilton, Ferris Fleming	SLR; CAF
Harrold, Henry Warren	SLR; CAF
Heller, Myron	SLR; CAF
Hildreth, Edward Ernest	SLR; RWT
Hilliard, Walter Bertan	SLR; RWT
Hall, Kent Bruce	SLR; RWT
Hopkins, Lionel Petgrave	SLR; EHT
Hancock Royce D	SLR

Jack Moran, the heavy-weight pugilist, has just been commissioned second lieutenant at Kelly Field.

Helman, Leslie R	SLR
Hillman, Charles A	SLR
Horner, Harold R	SLR
Homan, Carroll L	SLR
Howard, James Daniel	SLR; THT
Halliday, Morris Samuel	SLR; SMM
Hall, Hartwell L	SLR
Halden, Harry	SLR
Hickey, Frederick J	SLR
Harper, Harry Moss	SLR
Holland, Maurice	SLR; THT
Hait, Roswell Newton	SLR; THT
Hogan, John Rippon	SLR; THT
Haller, Carl A	SLR
Happ, Clarence W	SLR
Heydorn, Harvey G	SLR
Hoare, John L	SLR
Hodgson, Harold C	SLR
Hoffman, Venre W	SLR
Hogan, William A	SLR
Humphrey, Watts S	SLR
Hall, Robert Keith	SLR; KST
Humason, Allen B	SLR
Harper, Harry Moss	SLR; MIT
Heydorn, Harvey G	DIK
Hawkins, Raymond D	CSO
Hogan, William A	DIK
Horner, Harold Richard	SLR; GLC
Hillman, Charles Alan	SLR; DIK
Hynes, Thomas Vincent	SLR; RSD
Helms, Leslie Reginald	SLR; RWT
Hancock, Royce David	SLR; RSD
Humphrey, Kenneth Blaine	SLR; MSC
Hall, William E	SLR
Harbeck, Edward V	SLR
Hirst, Barton C., Jr	SLR
Harris, Alexander Henry	SLR; MIT
Hume, Henry Woods	SLR; RSD
Hunt, William D	SLR
Henmon, Vivian A. C	REL; Note 6
Howard, Ten Broeck	Note 11
Howard, Earl W. G	SLR
Hall, Frank L	REL; AMV
Hale, Warren L	FLR
Hoffman, Ernest L	Note 15
Henninger, Roswell	Note 1
Hatcher, Ruby F	Note 1
Heftye, William M	Note 1
Healy, William R	Note 1
Hamilton, Lloyd A	FLR
Harrington, George P	SLR
Hazen, Raymond C	SLR
Heer, Clarence	SLR
Hughes, John J	SLR
Humphrey, Watts Sherman	SLR; RSD
Humason, Allan Burke	SLR; PFO
Happ, Clarence William	SLR; DIK
Heydorn, Harvey Gambetta	SLR; RSD
Haller, Carl A	SLR; LDT
Hodgson, Harold Cecil	SLR; LDT
Heitz, Frank F	PFO
Hogan, William Anthony	SLR; KST
Hoare, John Lansing	SLR; GLC
Hoffman, Verne W	SLR; RSD
Hackett, Frank D	CWT

I

Ives, H. E	FRF
Israel, Gerald Hearst	SLR; KST
Inge, Richard S	SLR; RSD
Ison, Nathaniel B	SLR
Immul, Paul P	AGC

J

Johnston, George E.	SLR; THT
Johnston, Justin L.	SLR
Johnstone, Clifford	SLR
Jagoe, Walker Marshall	SLR; THT
Jones, Arthur H.	SLR; THT
Jones, Delbert E.	SLR
Jones, Rederick H.	KST
Jaqua, John B.	FRF
Jennings, William P.	SLR; RSD
Johnson, Bayard	SLR; RSD
Johnson, Joseph K.	SLR; KST
Jeffries, Simeon Jackson	DIK
Jones, Christopher L.	SLR
Jones, Delbert Emmerick	SLR; RSD
Johnson, Christopher Lloyd	SLR; EHT

K

Kenyon, Douglas Houston	SLR; THT
King, Ivan Roverts	SLR; CSO
Kelly, Harold Richard	FRF
Kelly, James N.	FRF
Kent, Richard A.	SLR; CAF
Kistler, Bruce	SLR; CAF
Knotts, Howard C.	FRF; SLR; THT
Kidd, Maurice M.	FRF
Keeler, Philip B.	SLR
Kingsman, Spencer S.	SLR
Krout, Ray Worrall	SLR; THT
Kelleher, Melvin Blank	SLR; EHT
Kidder, Charles Joseph	SLR; THT
Kennedy, David S.	SLR
Kern, Frederick M.	SLR
Kinney, Morris	SLR
Kemp, Wallace Leo	SLR; CRI
Kimber, George Harold	SLR; THT
Kohfeldt, Fred Charles	SLR; GLC
Kicklighter, Charles H.	GIT
Koch, Frank M.	MSC
Kent, George S.	DIK
Kieran, Thomas, Jr.	SLR
Knight, Lloyd W.	SLR
Kaufman, Godfrey F.	FRF
Keeler, Philip Burr	SLR; MIT
Keen, Curtis A.	FRL
Kingman, Spencer Slade	SLR; MIT
Kennedy, Davil Shelton	SLR; DIK
Kern, Frederick Martin	SLR; DIK
Kinney, Morris	SLR; DIK
Koch, Alfred S.	SLR
Krogstad, Robert B.	FLR
Kropf, Walter J.	Note 1
Krapf, George W.	EHT; KST; GLC; CAF; Note 16
Kiernan, Thomas, Jr.	SLR; RSD
Knight, Lloyd Withrow	SLR; FOB
Kennedy, Donald B.	SLR

L

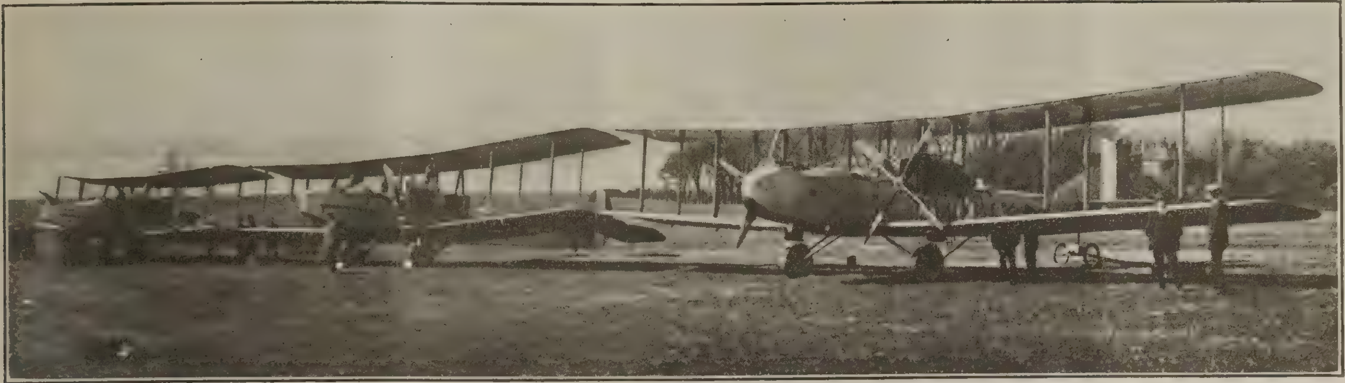
Lewis, Burton F.	FRF
Lewis, Hobart H.	SLR; RSD
Lewis, Floyd Clinton	SLR; THT
Lewis, Oscar B.	SLR; AAD
Levisee, Rexford B.	SLR
Lees, Herbert G.	SLR
Lubbers, Edward S.	SLR
Lokey, Thomas E.	SLR
Lauter, Albert Adolph	RWT; SLR
Logan, Henry	RWT; SLR
Lindsay, Harry B.	SLR
Lawrence, Edgar Alfred	FRF; SLR; THT
Latham, Sylvester Albert	SLR; THT
Leopold, Joseph	SLR; LDT
Lange, Richard	SLR; THT
Lavine, Abraham L.	REL; CSO
Lovenberg, Frederick Hamilton	SLR; THT
Livingston, Edmund Pendleton	SLR; THT
Larsen, Chauncey Murdock	SLR
Leonard, Edgar Welsh	SLR; CSO
Lodge, Welling Montagu	SLR; GIC
Lindsay, David B.	CAF
Lowe, Claude O.	CAF
Long, Monroe Hyde	SLR; GLC
Lewis, Tracy Hammond	SLR; GLC
Look, Clarence Albert	SLR; GLC
Loud, Harold Edgar	SLR; EHT
Lersch, Joseph Ferdinand	SLR; THT
Logan, Patrick H.	FRF
Larsen, Chauncey Murdock	SLR; KST
La Boiteaux, Andrew J.	SLR
Levy, Royal	SLR
Lubbers, Edward Strong	SLR; THT
Lees, Herbert George	SLR; KST
Lokey, Thomas E.	SLR; WDO
Love, Robert J.	CSO
Londsay, Harry Bernard	SLR; EHT
Lawson, Lawrence	Note 1
Laidlaw, Harold B.	FLR
Lawton, Mortimer, P.	Note 17
Lambert, Frank	FLR
Letzig, Frank W.	FLR
Leary, Thomas J.	CPR
Latham, Frank S., Jr.	FLR
Levisee, Rexford Byrde	SLR; RSD
Lee, George T.	SLR
Lemmon, Brice W.	SLR
Little, Robins	SLR
Livingston, Austin E.	SLR
Levy, Royal	SLR; CSO
LaBoiteaux, Andrew Jackson	SLR; EHT
Leonard, J. Cecil	DIK

Baron de Haven, instructor of the American Air Service Rotary Class at Tours.

M

McClean, Howard L.	SLR
McCall, George Alexander	SLR; SMM
McCoy, Jeter J., Jr.	REV
McKinley, Ashley C.	FOB
McDermott, Cleveland William	SLR; THT
McMinn, Wiley W.	SLR
McLaughlin, Cornelius D.	CPR
McWilliams, James L.	FLR; CDT
MacClure, Henry G.	FLR
MacGregor, Perley Everett	SLR; EHT
MacLeod, George Currie	SLR; FOB
MacDonald, Colin Campbell	SLR; RWT
Munford, Edward S., Jr.	SLR
Martin, Richard H.	SLR; EHT
Marshall, Thomas H.	SLR
Mahon, Rennie J.	FLR
Maloney, John Aloysius	SLR
Montgomery, Edward Geoffrey	SLR; CAF
Merx, Charles Frederick	SLR; CAF
Meigs, Martin Schenck	SLR; CAF
Mathews, Amos Myron	SLR; THT
Miller, Glenn R.	CSO
Marquardt, James C.	FRL
Monahan, Tom K.	FRF
Martin, Herbert Deceygne	SLR; EHT
Miller, Francis H.	SLR; EHT
Millard, Marland Boyd	SLR; KST
Mosier, DeThurston	SLR; WDO
Miller, Max Burns	SLR; KST
Mohr, James Harvey	SLR; CRI
Moon, Frank Leslie	SLR; KST
Mastin, Thomas Fearn, Jr.	SLR; GLC
Minor, William McClean	SLR; WDO
Motley, Langhorne V.	CSO
Madison, Fred Hart	PFO
Moore, Graham	SLR; CGC
Matheny, Willard R.	CPR
Moulton, Ferris S.	SLR; GLC
Martin, Leslie	SLR; FOB
Morris, Roy K.	RSD
Morrissy, James E.	FRF
Murray, Verne Lee	SLR; THT
Meyers, Harold	SLR; EHT
Magoffin, Paul P.	REL; KST

British Official Photo. **A few F.E.2.B machines of the Royal Flying Corps, ready for a flight.**



A group of twin-motored A. V. Roe fighting planes. The machine on the extreme left is equipped with two Sunbeam aero engines, in the centre two Green engines, and on the right two Rolls-Royce engines. Photograph by courtesy of the A. V. Roe Co.. Passed by the British censor.

Official French Aerial Warfare Exhibit Going to Philadelphia and Washington

The official French Aerial Warfare Exhibit, which has had such great success in New York, is going to Philadelphia and Washington. The exhibit includes the 140 remarkable Farré paintings, the official French aerial warfare films and Captain Guynemer's battleplane with which he brought down twelve German aviators. The New York exhibit was a great success. It created substantial interest in aeronautics, the Third Liberty Loan and the war in general. The official and executive committees are as follows:

Committee of Honor: His Excellence, Ambassador Jusserand; André Tardieu, French High Commissioner; Marquis Melchior de Polignac, Major General George O. Squier; Hon. Howard E. Coffin, Chairman, Aircraft Board; Colonel E. A. Deeds, Member, Aircraft Board; Colonel Montgomery, Member, Aircraft Board; Colonel Charles E. Lee, British Royal Flying Corps; Commandant G. Tulasne.

Executive Committee: Mrs. William Astor Chanler, Chairman; Commandant G. Tulasne, Mrs. Edmund L. Baylies, Mrs. John Magee, Mrs. Walter E. Manyard, Mr. Frank Crowninshield, Lieutenant Henri Farré, Mr. Alan R. Hawley, Baron Charles Huard, Mr. Henry Woodhouse, Mr. Walter E. Manyard, Treasurer; Mr. Bennett E. Tousley, Secretary.

The Sky Fighters of France is an exhibition, organized by the French Government and aided in the United States by the Government and by patriotic Americans of all kinds (1) To increase and foster an interest in aeronautics and aircraft production, (2) To support and educate the children of French aviators killed in action.

Chanute Field News

In order to keep the machine shops running smoothly during the flying season, two aerial squadrons, have been designated as school squadrons at this field. One of these squadrons is composed almost exclusively of skilled aeroplane mechanics. Lieut Harry M. Winner has been named as the commanding officer of this squadron.

The first Red Cross nurses arrived at Rantoul this week. Four have been detailed to the local hospital.

The Government is planning the purchase of an auxiliary flying field here. Several sites are under consideration but none have yet been definitely secured.

Personal Paragraphs

Mr. and Mrs. John G. Withrow, of Park Avenue, East Orange, N. J., have announced the engagement of their daughter, Miss Jean Lindsay Withrow, to Flight Commander Oliver Colin Le Boutillier, son of Mr. and Mrs. Oliver Le Boutillier, of Glenwood Avenue, East Orange, N. J. Commander Le Boutillier is in the Royal Naval Air Service, and at present is serving in France. Miss Withrow was graduated from the Dearborn Morgan School in 1916.

Jack Pickford of "movie" fame enlisted in the Aviation Section and is on the way to training camp.

Mr. and Mrs. Aksel Wichfeld, of Washington, who are at the Ritz-Carlton, announced the engagement of Mrs. Wichfeld's stepdaughter, Miss Frances Moore, to Lieut. Henri Marquisan of the French Flying Corps. Lieutenant Marquisan is the son of Henri Marquisan, of Paris, a Chevalier of the Legion of Honor, and is now with the French Aviation Mission in Washington.

Miss Frances Colette Fallon married Lieutenant John B. Golden, of the Aviation Section. The wedding took place in New York. Lieut. Golden was a cadet at the U. S. Military Academy at West Point, but resigned to practice law. He was a member of the Assembly in 1914-1915, and also served as Deputy Attorney General.

When Harold Wright left his mother over a year ago to be a mechanic in the French air forces, he assured her that his duties would never bring him near the enemy. But this was only to re-assure her, for he intended serving as a pilot. It was several months before Mrs. Wright learned the truth—on the occasion her son bagged his first "Boche." He now has two to his credit, as well as an observation balloon.

Mr. J. B. Howell, of the Sales Department of the Bound Brook Oil-less Bearing Company, has been called to active service in the U. S. Army, and is now training at Camp Dix.

Lieut. Georges Flachaire, of the French Army, who is instructing at the Mineola Aviation Field, started on a flight to Washington in a 150 h.p. Spad machine, without making any more preparation than to say to his mechanic, as he started his motor, "I'm off for Washington."

At the American Aviation Training Fields

Lieut. Carroll, the famous composer and librettist in the U. S. Aviation Corps, is recovering from injuries resulting from a bad spill he had at one of the flying fields in Texas. Mr. Carroll is composer of many well-knewn "ragtime" songs, and gave up an income of $30,000 in order to serve in the defense of Democracy.

The course of instruction at the School of Military Aeronautics at the University of California is to be increased to twelve weeks. No definite curriculum can as yet be given out but it is expected that the additional time will be devoted to studies of a purely military character. More emphasis will be put on practical work than on theory and the extra three weeks will give the aviators a much more thorough knowledge of military work.

A school of meterology for aviation students has been established in San Francisco where flying cadets will be able to learn about air pockets, prevalent winds and other things necessary for their training. A. A. Beals, the district forcaster of the Weather Bureau, is in charge of the instruction.

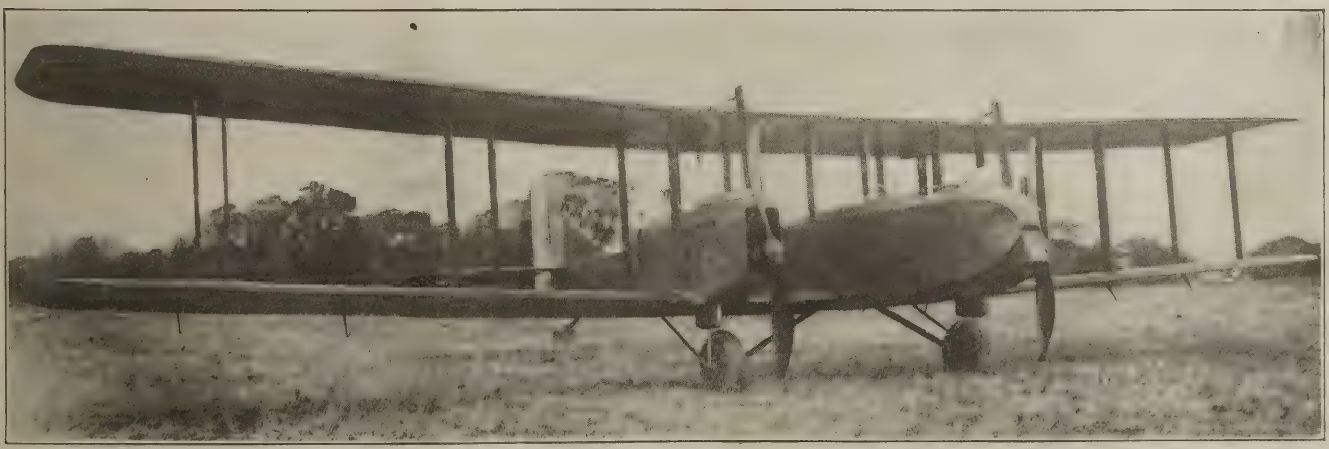
Colonel J. T. Nance, formerly commandant of the cadets at the University of California, has succeeded Colonel H. B. Hersey as head of the Fort Omaha Balloon School.

Major J. P. Mitchel, former mayor of New York City, made his first flight alone recently at Rockwell Field, San Diego. It was so successfully accomplished that he made four more solo flights on the same day, remaining aloft a total of forty-five minutes. Altogether Major Mitchel has only had twelve hours' flying instruction.

Threat of Reprisal Modifies German Policy

It was officially announced that the German Government had released from special imprisonment the British Lieutenants Scholtz and Wookey, the two airmen who some time ago were given prison sentences for distributing propaganda in Germany by dropping printed matter from aeroplanes over German territory.

The release was due to a threat by the British Government to take reprisals unless the airmen ceased to be subjected to unusually harsh treatment.



Three-quarter view of the twin-motored A. V. Roe bombing plane, manufactured by the A. V. Roe Company, of Manchester, England. Photo passed by British Censor.

EVERY MILITARY AVIATOR OUGHT TO KNOW WHAT HIS OWN AND THE ENEMY'S MACHINE CAN DO AND HOW THEY LOOK

By HENRY WOODHOUSE

Author of the "Text-book on Naval Aeronautics", "Text-book on Military Aeronautics", etc.

IN the last number the writer pointed out that the Allied Government found it necessary to teach their aviators and students all about their own machines, and as much as possible about the enemy's machines, particularly their appearance. As a basic principle, the aviator is taught that what does not look like one of the Allied machines must be an enemy machine. Therefore, every effort should be made to bring it down.

The anti-aircraft forces are taught the same thing, and that knowledge of the features of the different types of aeroplanes is one of the prime factors in making the anti-aircraft forces efficient.

Lacking that knowledge, both the Allied air forces as well as the anti-aircraft defenses, get confused and permit the enemy to get temporary advantages, which cost the lives of Allied aviators, as well as of the population of the cities which are raided—without mentioning the strategic advantages which the enemy gains through gathering information or surprising the Allies.

Besides teaching military aviators to know their own and the enemy's machines, what they can do and how they look, the Allied authorities also found it advisable to have continuous progressive changes in their types of aeroplanes.

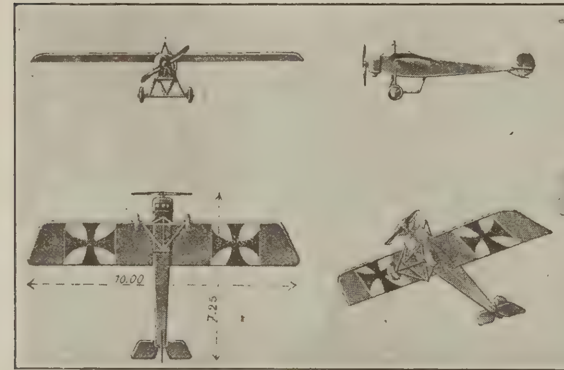
It was found that German aviators had a certain amount of fear for a new type of aeroplane, because they did not know what it could do and past experience had taught them to beware of appearances. As a member of the Lafayette Escadrille put it: "The Boche was never so surprised as when he attacked a certain type of machine which looked like a two-seater, and got fired on by the third passenger, who was an extra gunner, well equipped with twin Lewises."

The policy of keeping the enemy "guessing" is good strategy—so long as it does not interfere seriously with production. It can be applied especially in the smaller types of machines used to maintain the supremacy in the air during the daytime on the fronts. It has little value in so far as the large bombing machines used for night bombing are concerned, because the night aeroplanes cannot be seen. It may be deducted from the types of German machines captured that the Germans are also following this policy. They keep up a continuous progressive change of types, adopting the good points of captured Allied machines, adding other points which are suggested by the progress of the science.

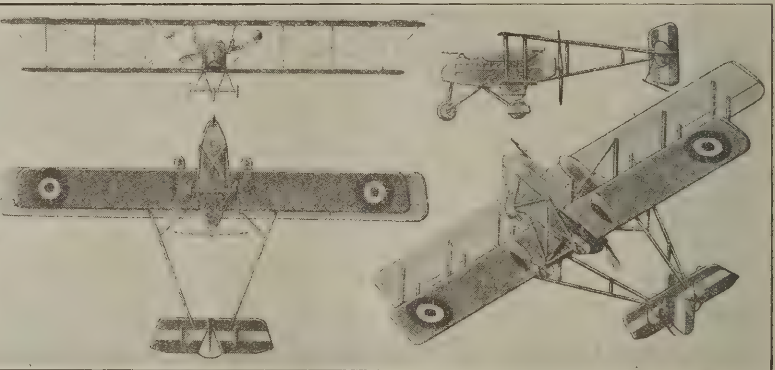
The Gothas followed the capture of the Handley-Page bomber, and now the dispatches advise that the Germans are building larger machines equipped with four motors.

Some of the smaller machines look very much like the French and British machines and it would be hard to recognize one from the other, were it not for the iron cross on the planes. This similarity in characteristics has necessitated closer study of German types and how they look.

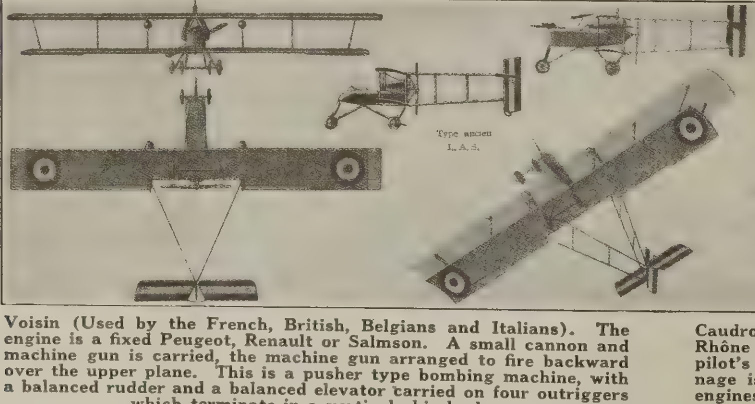
Aeroplanes to follow in succeeding issues, in connection with the identifications of military aeroplanes: Handley-Page, Pomilio, Avro, S. V. A. and others.



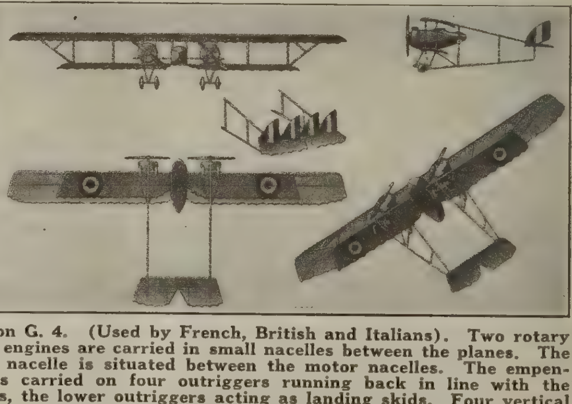
Fokker monoplane (German). Follows closely the French Morane, especially as to its balanced elevators. Equipped with a rotary Oberursel 80 or 100 H.P. engine. One of the first German machines to successfully employ a mechanically operated machine gun firing through the sweep of the propeller



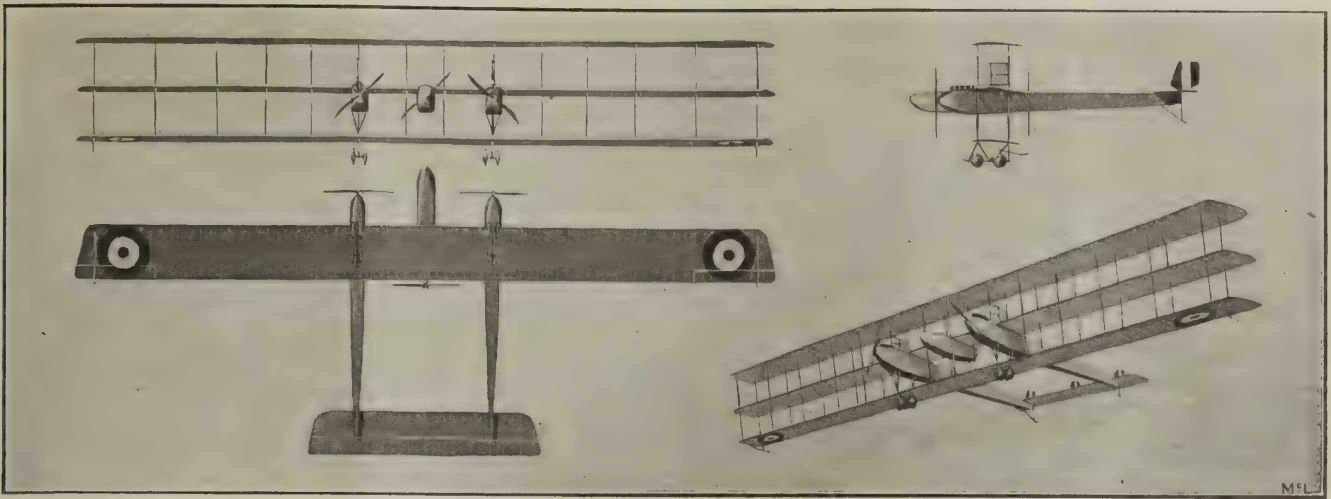
Bréguet (French). Bombing machine of the pusher type. Renault engine. Carries a light cannon or machine gun. Landing gear, 3 wheels. Two vertical fins and a vertical rudder. The Bréguet has been used in numerous raiding expeditions, an operation for which it is particularly fitted



Voisin (Used by the French, British, Belgians and Italians). The engine is a fixed Peugeot, Renault or Salmson. A small cannon and machine gun is carried, the machine gun arranged to fire backward over the upper plane. This is a pusher type bombing machine, with a balanced rudder and a balanced elevator carried on four outriggers which terminate in a vertical chisel edge



Caudron G. 4. (Used by French, British and Italians). Two rotary Rhône engines are carried in small nacelles between the planes. The pilot's nacelle is situated between the motor nacelles. The empennage is carried on four outriggers running back in line with the engines, the lower outriggers acting as landing skids. Four vertical fins and four rudders are located above the tail



Caproni Triplane (Italian). Italy's best known aeroplane, and the [illegible] engines; two located in tractor position at the front end of each fuselage, and one pusher at the rear of the pilot's nacelle at the center. Capable of carrying great weights (nearly 3000 lbs.), and used particularly in bombing work. The design is distinct and easily distinguishable by its three main planes, two tractor fuselages and central nacelle, the monoplane tail with a single tail flap (elevator) and three balanced rudders situated above the tail. The landing gear is composed of four pairs of wheels located below either fuselage

War Department Acts on Aerial Coast Defense

Active preparations to strengthen the aerial defenses of the Atlantic seaboard were begun by the War Department, with the appointment of an army board to select sites for aero squadrons and balloon companies.

Major Norman W. Peek, of the Signal Corps, was named to head a board to meet at Charleston, S. C.; Fort Totten, N. Y., and Boston. Commanders of the South Atlantic, Middle Atlantic and North Atlantic Coast Artillery districts will each name an officer to sit with the board, while it is considering needs of each district.

The other members of the board are Major Edward D. Sinks, Medical Reserve Corps; Second Lieutenant C. L. Stuckland, Mr. W. P. Stevens, A. M. E. Signal Corps at large, and a fifth member to be selected by the commanding officer of each coast artillery district upon the request of the senior member of the board.

Army Balloonists Injured

Nine army aeronauts were injured when the balloon in which they were making a trial flight from San Antonio fell 3,200 feet near Killeen, Texas.

Captain B. H. Fournier, of San Antonio, suffered a severe scalp wound; Cadet G. W. Adams, a broken leg, and Cadet E. M. Hawley's back was sprained.

Something went wrong with the valve in the top of the gas bag, it was said, when the balloonists attempted a landing. The balloon dropped at a speed of thirty feet a second. All the injured were taken to San Antonio.

N. Y. University to Assist Aircraft Program

New York University soon will begin vocational training of 100 soldiers of the National Army for service with the United States aeroplane forces in France, according to an announcement made by Dean Charles Snow, of the Engineering School, at University Heights.

The university's engineering school, its faculty and its equipment are to be placed at the War Department's disposal for the instruction of the soldiers in various mechanical lines related to aeroplane service. The instruction will be under the general supervision of any army officer.

The War Department has telegraphed to the university that the soldiers would be assigned to the Engineering School for instruction beginning April 1. The course will last until October.

Twenty of the soldiers will be trained for service as gas engineers, twenty as mechanics, thirty as electricians and twenty will receive special instruction in the delicate wood working required in keeping the aeroplanes in working order.

This co-operation by the university with the War Department in the rapid training of soldiers for the aeroplane service in France is understood to be the first step in a programme of extensive co-ordinated effort by the institution with the military authorities in making skilled technical and mechanical experts available for war work.

Army Insurance Totals Twelve Billion

More than $12,000,000,000 worth of insurance has been written on the lives of American soldiers, sailors and nurses by the War Risk Insurance Bureau, Secretary McAdoo has announced today. Up to the close of business March 6, 1,392,324 applications, representing insurance of $11,256,448,500, had already been received at the bureau, and late reports from the American forces in France, together with insurance now in transit from distant points, indicate that the total written to date is well above $12,000,000,000, covering more than 1,500,000 persons in the military or naval service. In February alone more than $5,000,000,000 worth was written.

The average amount of insurance applied for is $8,095. The maximum permitted is $10,000 and the minimum $1,000. Final figures show that the United States Army, both here and abroad, is well above 90 per cent. insured.

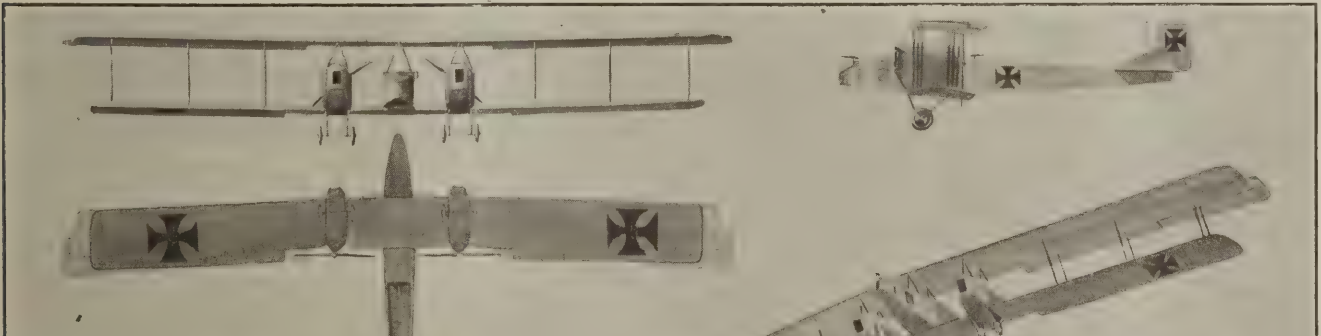
Commission on Naval Bases Recommends Establishment of Naval Air Stations

In a preliminary report by the Commission on Navy Yards and Naval Bases it is recommended that coastal air stations be established at Brunswick, Ga., at Tampa on St. Andrew's Bar, and Mobile, Ala. If necessary, the report states a station can be established at Sabine Pass, Texas, though it is not recommended as a good site for the purpose.

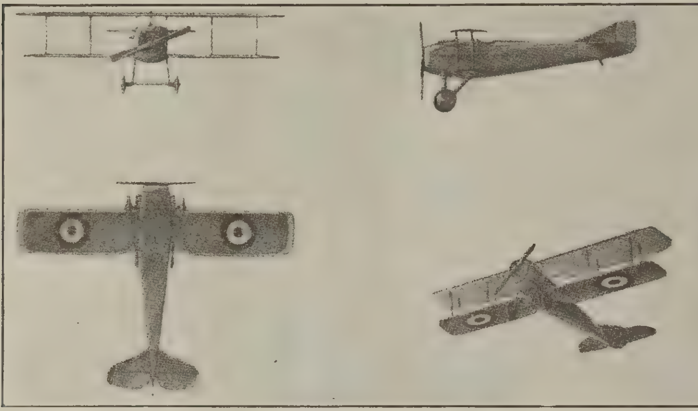
On the Pacific coast a main aviation station at San Diego, a base aviation station at Puget Sound and Mare Island Navy Yards and an operating aviation station at Port Angeles, Wash., are also proposed.

Aviation Officers Visit Y. M. C. A. School

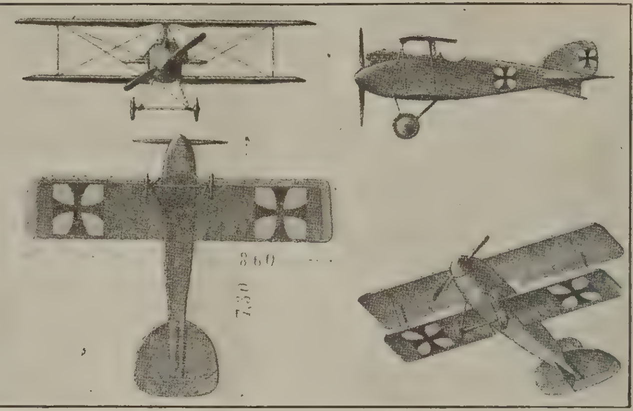
During the past few days a group of officers in the U. S. A. Aviation Service have been the guests of the Aeroplane Mechanics School of the West Side Y. M. C. A., while putting the finishing touches on their education in the mechanics of certain types of engines, notably the Gnome, with which all the Government schools are not equipped. The visit of the officers was arranged through Benjamin Williams, secretary of the Manufacturers' Aircraft Association, by request of the Government Aviation officials. They are all here enroute for the front and expect to sail shortly for "Somewhere in France."



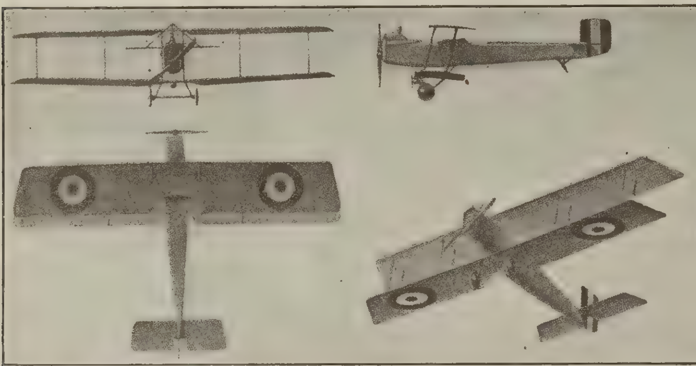
Gotha (German) twin-engine warplane. The machine used in a considerable number of raids on London and recently on Paris. Has a span of 78 feet and carries two Benz engines totalling to 450 in H.P. The machine bears a resemblance to the British Handly-Page, from which data for constructing the Gotha was obtained, but it is a pusher and the Handley-Page a tractor. Identified by its overhanging balanced ailerons (similar to the Handley-Page) and its usual monoplane tail (differing from the British machine which has a biplane tail). Three machine guns are carried; one in the front, one at the rear cockpit and a third below it, which can be fired downward and backward through a so-called "gun-tunnel" on the underside of the fuselage.



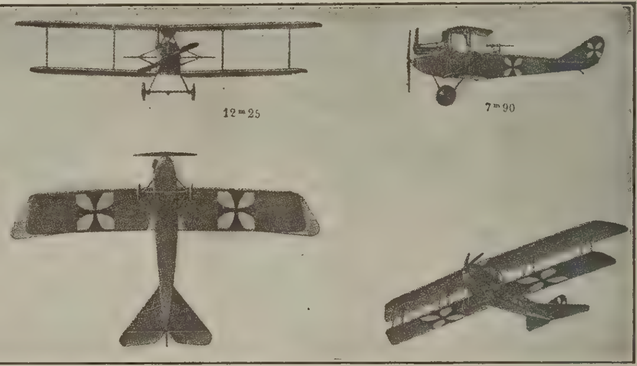
Spad single-seater scout. (Société pour l'Aviation et ses Dérivés). Used by the French and British. All Spads are equipped with Hispano-Suiza engines, either 150 or 200 H.P. This machine is easily confused with the Albatros, a German scout. One of the most popular scouts of all the French or British machines, and therefore used in large numbers



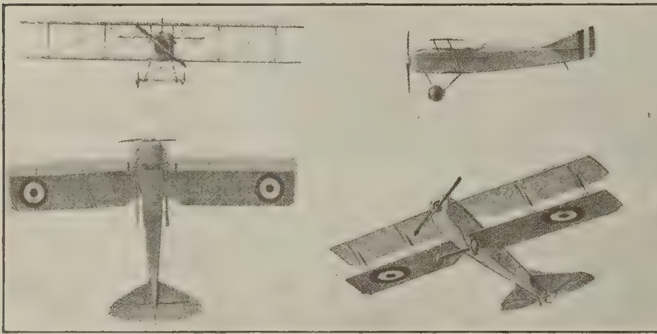
Albatros D. 1. Single seater scout. (German.) One of the fastest of German aeroplanes. It is equipped with a 170 H.P. Mercedes engine or a 225 H.P. Benz and provided with two fixed machine guns arranged to fire through the propeller. The propeller is capped with a forward spinner which carries out the streamline effect of the body



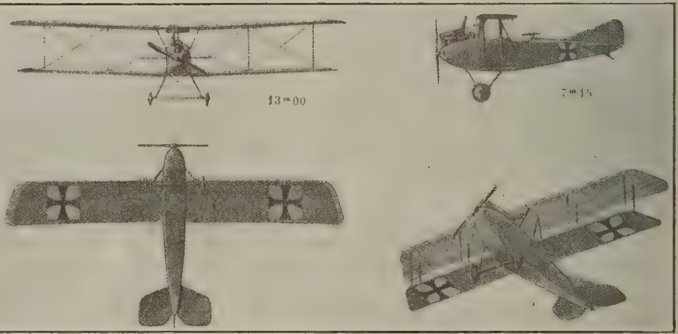
A.R. or A.L.D. (Type Corps d'Armée, with a Renault or Lorraine-Dietrich engine.) French machine for all uses. The A.R. has a Renault engine and the A.L.D. has a Lorraine-Dietrich, with a fixed machine gun firing through the radiator and one movable at the rear. Planes are invertly staggered and the fusilage is set above the lower plane



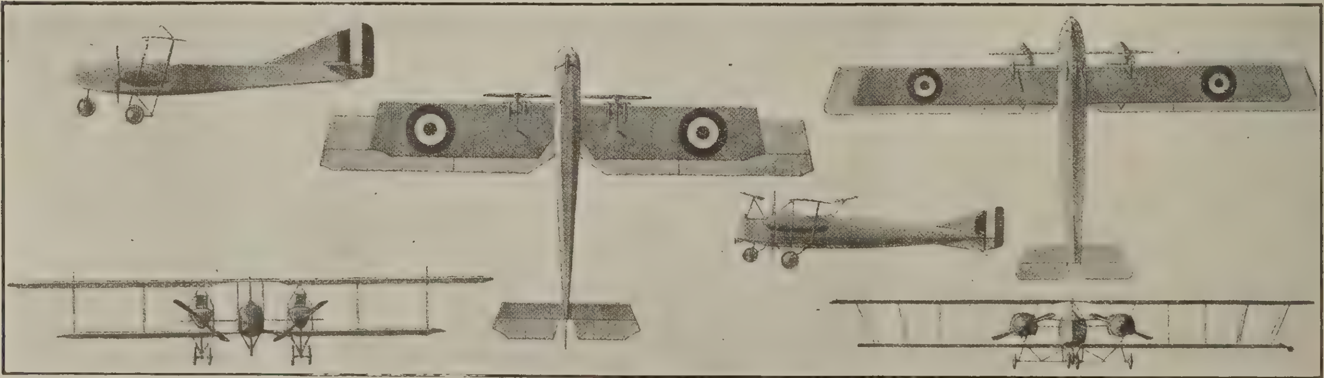
Rumpler. (German.) Has the Mercedes 175 H.P. engine, a fixed and a movable gun. Radiator semi-circular, set into the upper plane. Vertical exhaust stack for the engine. Carries lance-bombs at times. San, 12m25. Length overall, 7m90. Later Rumplers are equipped with 260 H.P. Mercedes or a 250 H.P. Mayback engine



Spad two seater. (French.) Hispano-Suiza engine. Similar in outline (and construction) to the Spad scout. The two-seater carries a movable gun at the rear, in addition to a fixed Vickers machine gun synchronized with the propeller and firing directly ahead. The planes are staggered and swept back at about 3°



A. E. G. (Allgemeine Elektrizitäts Gesellschaft.) A German two-seater with a 175 H.P. Mercedes engine. It carries a gun synchronized with the propeller and one movable at the rear. Upper central wing panel flat in span; outer sections with slight dehedral. Radiator carried in the central panel and a stack leads the exhaust of the engine above the plane. Planes slightly swept back



Letord. (French.) A three-plane twin-motored biplane tractor using Hispano-Suiza engines. The planes are staggered backward and the struts are run vertically backward at the tops. Five wheels are used in the landing gear

Morane-Saulnier twin-motored. (French.) This is a three-place tractor with nacelles carrying either rotary Rhone engines or fixed Hispano-Suiza engines. Two machine guns are used. Besides the struts at the body and nacelles, there are two pairs of vertical struts and two pairs of inclined struts at either side of the body. Features of this machine have been copied by the German A.E.G. and the Gotha

METEOROLOGY: AIR CURRENTS AND EDDIES

By PROFESSOR W. C. DUFFIELD, D.Sc.

THE eastern coast is generally under the influence of a stream of air which flows in from the Atlantic Ocean from the west or southwest. Unlike the trade winds, which are the feature of the latitudes nearer the equator, and which blow steadily and regularly, this current is broken up into eddies. These disturbances are carried along by the stream, but they also move through it and stir up different masses of air as they pass along.

These eddies prevent the winds from blowing perpetually from the southwest, and they provide the succession of winds which is experienced by the country over which they travel. We may represent their behavior by Fig. 1, in which the general flow of air is indicated by the straight arrows flying from a southwesterly direction, and a typical eddy by the curved arrow. As this particular eddy moves along, the country below is subject first of all to a south wind blowing in the advance part of the eddy, and after a succession of winds in other directions to a wind from a northerly direction, shown by the arrow in the rear of the eddy. It is these eddies which form in the stream of air flowing over the country which are responsible for the variable winds experienced in these latitudes.

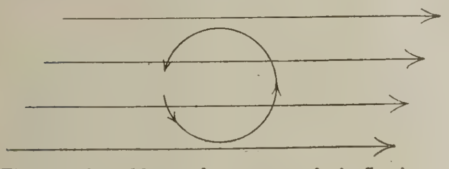


Fig. 1.—An eddy in the stream of air flowing from the Atlantic

The Flow of Air

The stream is never free from them and often there are several eddies over different parts of the continent at the same time, and the flow of air over those parts of the country which lie between them is apt to present a very complicated problem; long experience has, however, enabled meteorologists to learn how the winds are likely to blow for any given distribution of these eddies, and it so happens that the air currents which are set up when a single eddy is passing over the country are of great importance in aviation, and are simple to understand. Good flying weather and bad flying weather are determined by the kind of eddy and by its exact position with regard to the place on the earth's surface over which the airman is flying. We shall first discuss the nature of the eddies which an aeroplane is likely to experience, with special reference to the currents of air composing them; this involves one feature which is not quite what would have been expected, and therefore requires some explanation; we shall later on explain how it is possible for the airman to discover by means of a weather map the existence of these eddies and to recognize them and to gain an idea of the kind of weather they are likely to bring with them.

It must be realized that meteorology can never be regarded as an exact science, and that on any particular occasion there may be conditions of temperature or some local influence which will interfere with the general nature of the disturbance. All that we can hope to do is to give the broad basis upon which the actual weather conditions are founded; the possibility of their being modified must not be overlooked.

An eddy such as is pictured in Fig. 1 represents a typical cyclonic disturbance or "depression." The circulation of air is seen to be anti-clockwise, but it is only developed in this form in the strata which are at least two or three thousand feet above the earth's surface. Nearer the ground the friction of the air causes the direction of the air currents to take a turn inwards towards the center.

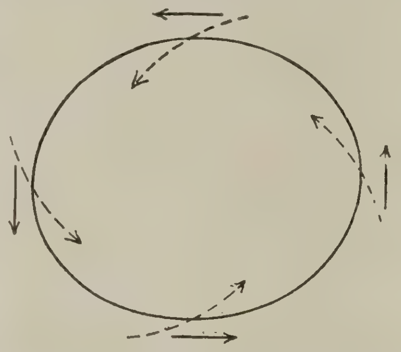


Fig. 2.—The flow of air in the upper levels of the atmosphere is represented by the full arrows; the flow near the ground, by the dotted arrows. The diagram represents the circulation of air about an eddy.

Rotation of the Earth

The directions of the air flow at ground level and at high altitudes are shown in Fig. 2. The full arrows represent the direction of the wind at high levels, the dotted arrows the direction at ground levels. An airman rising into the air will consequently experience a change of wind which will materially affect his course. It is scarcely necessary to remark that in order to maintain an inward flow of air towards the center the atmospheric pressure must be lower there than in the surrounding country; that is to say, the system is typical of a low barometer. The fact that an area over which the pressure is low can exist without a direct flow of air into it is in itself remarkable. One would expect the air outside, which is at a higher pressure, to pour straight into it and make up the pressure to its normal value, but this is not the case; it could only be so if the earth ceased to rotate. The rotation of the earth is responsible for deflecting the stream of air, which undoubtedly tends to flow directly into the low pressure region, and causing it to take a curved path.

In the northern hemisphere the rotation causes every current of air to be deflected to the right of the direction in which pressure would tend to drive it. If, for example, in Fig. 3, L is a part of the country over which the pressure is abnormally low, a mass of air at A some distance from L would be under the influence of a force tending to drive it from A into L, because of course the air, like any other fluid, tends to be driven from a place where the pressure is high to a place where it is low. But instead of moving along the path A, L, the rotation of the earth causes it to deviate to the right—that is to say, along A, B. At B the tendency is for it to flow directly along B, L, but again the influence of the rotation is to deflect it along B, C, instead. From C it moves to D and so on. The direction of the currents of air at any moment is therefore given by the curve A, B, C, D, E, F. This is perhaps the most difficult feature of meteorology, and one which has made it an unpopular science, but once the fact is grasped that air does not flow solely under the influence of the pressure distribution, but also under the influence of the rotation of the earth, the main difficulty is overcome, and the rest is comparatively plain sailing. The reader will probably have realized that it is not always quite clear whether the pressure differences are the cause of winds, or whether the winds occasion the differences of pressure. What we do know is that they are intimately connected, and that the greater the differences of pressure between different parts of the country, the greater the strength of the winds. When the barometer is falling rapidly as a disturbance passes over the observer, the winds are likely to be of greater force than when the fall is gradual.

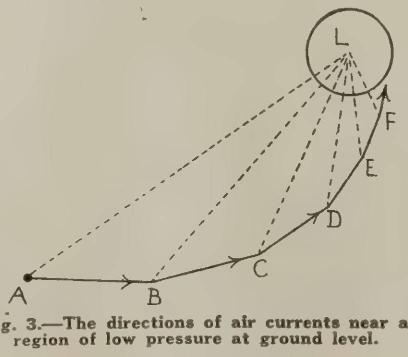


Fig. 3.—The directions of air currents near a region of low pressure at ground level.

The whole phenomenon of the flow of air about a region of low pressure is rather like the flow of water near a hole in a bath, though the two are by no means the same in structure. The water does not flow straight into the hole, but circles round it, more or less spirally, the currents at the bottom being more disturbed by friction than those at the top.

Eddy Circulation

It is a very curious thing that the air in eddying round a low pressure area never actually seems to get to the center. It used to be thought that the air eventually arrived there and then flowed upwards, very much as if it were going up a vast chimney; indeed, the idea of an upward current in the center was regarded as essential for the maintenance of this type of whirl in the atmosphere, but the investigations of Mr. Dines in this country have shown that there is practically no updraught in the center of the eddy and that the old idea did not seem to be satisfactory. Sir Napier Shaw and Mr. Lempfert have recently succeeded in tracing the path of a mass of air in the neighborhood of a depression, and they find that the air does not as a rule succeed in flowing into the center at all; there is always a flow directed spirally towards the center at ground level, as we have already seen, but as the center is moving away towards the northeast it has left the place towards which the flow was directed before the streams get there.

The particular type of disturbance with which we have been dealing represents a region in which flying is as a rule attended with a certain amount of risk; it is usually cloudy, windy and rainy, and a type of squall sometimes accompanies it which makes flying impossible. This eddy circulation is usually termed a "depression" or a "low," and is frequently a visitor to these shores; it usually extends over an area very much larger than the British Isles.

When the eddy goes round in the other direction—that is to say, in a clockwise sense in the northern hemisphere—the weather is usually favorable for flight, the barometer then stands high in the center, and the air tends to stream outwards instead of inwards, and the disturbance is known as an anti-cyclone.

WING BRACING AND HEAD RESISTANCE

By MARCO POLO

IN COMPARING the performances of modern aeroplanes with those of pre-war days, one cannot but be impressed by the enormous progress made during the few intervening years. This progress has not been in one direction only, but is distinctly noticeable in every aspect of the capabilities of an aeroplane, such as climb, manœuverability, reliability, duration and speed To what can this great improvement be ascribed? Not to any single thing by itself, but to general improvement in detail design. As far as the speed and climb are concerned, progress has been to a very large extent due to engines of greater reliability and higher power. It is doubtful, however, whether this increased power is the sole, or even the chief, cause of the progress made. Very great improvements have been made in the aeroplanes themselves, notably as regards wing sections, of which there are now in existence examples far exceeding in efficiency those available before the war. Another point that has received the closest attention of designers and constructors is the reduction of head resistance. This applies not only to the body of the aeroplane, but also to the wing bracing and strutting; and it is the latter aspect with which it is intended to deal in the present notes.

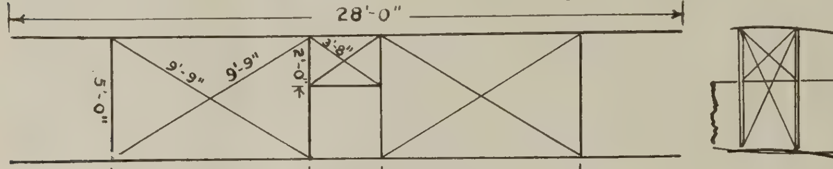


Fig. 1. Diagram of the Wing Bracing of a Standard Scout.

Span, upper and lower, 28′ 0″; chord, 5′ 0″; area, upper, 140 sq. ft.; lower, 125 sq. ft.; total, 265 sq. ft.; gap, 5′ 0″; total length of struts, 28′ 0″; wires, 128′ 0″; resistance factor, 184.

In order to provide a foundation on which to base a comparison of various forms of wing bracing, it will be assumed that a designer is faced with the problem of designing a machine to fulfill certain given conditions, and that in order to do this he finds that, with the power and wing sections at his disposal, he requires an area of 265 square feet. This is, perhaps, a somewhat larger area than that used on the latest fighting machines, but as this fact will not affect the argument qualitatively, it has been chosen for the sake of convenience. Now, in order to get the best possible results out of his machine, with the area, wing section and power given, assuming that the form of body has already been decided upon, the designer will naturally ask himself what is the form of wing bracing that will give the least resistance, conforming, of course, with the question of proper structural strength.

In Fig. 1 is shown diagrammatically the front spars with their wire bracing of what may be termed a standard scouting biplane The span is 28 ft., and the chored and gap are 5 ft. respectively. Although a stagger is almost universally employed in modern scouts, we have chosen the vertical type as being simpler to deal with, and as this does not materially affect our argument, it is, we think, permissible. The "free length" of spar is about 8 ft. 3 ins., a somewhat excessive distance for great strength, and calling for a fair size spar, but the proportions, if not the actual dimensions, conform approximately to standard practice. The attachment of the top plane is of the type termed "canopy" mounting by the Germans, *i. e.*, there is a short top plane centre section, supported on four vertical struts from the body.

From the list of dimensions accompanying each diagram, it will be seen that the last figure in the list is called "resistance factor." This expression, which is employed for want of a better term, had better be explained before proceeding any farther. Before it is possible to make a fair comparison between the various forms of wing bracing in a machine of the scout type, it is necessary to assign to each of the component parts of that bracing a value for resistance. Now, as the purpose of the present notes is not to go into calculations of the actual resistance in pounds at a certain speed, but merely to compare one form of wing bracing with another, it will not be necessary, for the purposes of the argument, to know the actual resistance per foot run of the wires and struts employed, but it *will* be required to know how the resistance of one unit length of strut compares with that of one unit length of wire.

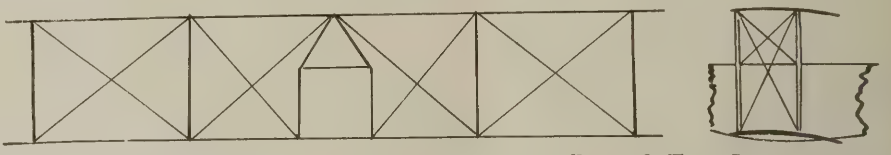


Fig. 2. Diagram of the Wing Bracing of a Halberstadt Type Scout.

Span, upper and lower, 28′ 0″; chord, 5′ 0″; area, upper, 140 sq. ft.; lower, 125 sq. ft.; total 265 sq. ft.; gap, 5′ 0″; total length of struts, 50′ 0″; wires, 183′ 0″; resistance factor, 283.

From the reports published by the various institutions carrying out wind-tunnel experiments, it would appear that a 10-gauge smooth round wire offers approximately the same resistance per foot run as a good section strut of the dimensions employed on a machine of the scout size and type. Since, however, in modern aeroplanes, at any rate on high speed ones, round wires are never employed, it will not be fair to assign to the struts the same resistance value as that of the wires. The so-called "streamline" R. A. F. wire, which is not, of course, a true streamline section, is not generally favored by private designers for various reasons, so I shall refrain from making the comparison with this particular type of wire. A method more generally preferred by many is to employ duplicate cables placed at a distance of about an inch behind one another and having a wood-filling in between them. Although this combination may not give an absolutely true streamline section, its resistance is in all probability quite as small as that of an R. A. F. wire, and it will, one is inclined to think, be found to be considerably stronger, especially against sudden loads, such as those imposed on the cables when flying in a "bumpy" wind. If it be assumed that such a combination of cables and wood-fillings will measure ½ in. by 1½ in., while the strut sections measure 1¼ in. by 4 ins., we shall take it, in view of the less perfect section of the cables *cum* wood fairings, that the resistance per foot run of the struts will be twice that of the cables. This figure is, admittedly, quite an arbitrary one, and as the whole argument rests entirely upon these relative resistance values, it is, of course, important that they should be correct. I do not think, however, that they will be found to be very far wrong. Data relating to this subject should be available in every designing office, and thus designers should be able to check the accuracy of our assumption. In any case, any error due to incorrectness of this so-called resistance factor will only affect the argument quantitatively.

Referring again to Fig. 1, it will be seen that the "resistance factor" of the standard scout for the area and proportions chosen is 184. This figure is arrived at by multiplying the length of struts by two, the value assigned to strut resistance compared with that of the cables, and adding the product to the total length of wires, or, more correctly speaking, cables. This "resistance factor," then, forms a basis for comparison.

In Fig 2 is shown the form of bracing employed on the German Halberstadt biplanes, *i. e.*, there are two pairs of inter-plane struts on each side, and the top planes are attached to *a cabane* instead of to the "canopy" usually found on scouts of British design. Next let us examine how this form of bracing compares with that shown in Fig. 1. The area, as before, is 265 sq. ft. The total length of wires is found to be 183 ft. against the 128 ft. of the standard scout type of Fig 1. The total length of struts is 50 ft. instead of the 28 ft. found for the standard scout. The "resistance factor," therefore, is 283 against 184, quite an appreciable difference, which would reduce considerably the performance, both as regards speed and climb, of the machine with the Halberstadt type bracing. It should be pointed out, however, that this bracing would be very much stronger, as the "free length" of spar is considerably shorter than with the one pair of struts arrangement. The reason for its adoption in the Halberstadt is to be sought for in the fact that a large heavy water-cooled engine was fitted, whereas most, or at any rate many, of our small scouts have a much lighter rotary engine. For a light engine the Halberstadt bracing is, therefore, to be considered less efficient than the standard scout bracing.

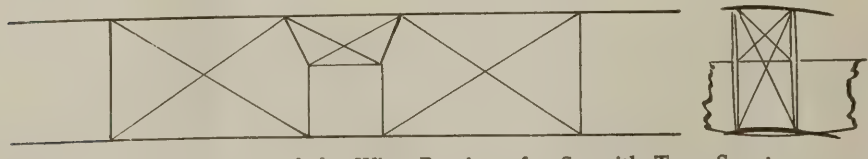


Fig. 3. Diagram of the Wing Bracing of a Sopwith Type Scout.

Span, upper and lower, 28′ 0″; chord, 5′ 0″; area, upper, 140 sq. ft.; lower, 125 sq. ft.; total 265 sq. ft.; gap, 5′ 0″; total length of struts, 29′ 0″; wires, 128′ 0″; resistance factor, 186.

The first development of what is termed in this article the standard scout bracing is shown in Fig. 3, which is that first introduced by the Sopwith Aviation Co., and since employed by many others. This arrangement differs from the standard only in the placing of the body struts supporting the centre section of the top plane. These struts, it will be seen, instead of forming a vertical continuation of the body struts proper slope outwards a few degrees. An examination of the list of dimensions underneath the diagram in Fig. 3 shows that the total length of wires is the same as that of Fig. 1, while, owing to the outward slope of the struts, the total length of struts is one foot greater than that of Fig. 1. The "resistance factor" is therefore 186 against 184 of the standard scout, a negligible difference when it is remembered that by having the struts sloping outwards the "free length" of the upper spar, which is the heavier loaded, is reduced, with a consequent strengthening very desirable in a machine of this type. This arrangement may then be said to be very good, both as regards resistance and strength.

SPINNING

By DEAN I. LAMB

SPINNING arises from sideslipping. Sideslipping is of two kinds—outwards and inwards. A flyer must get to know which of these his sideslip is, and whether his air speed is normal or abnormally low. The former (outwards sideslip) is almost always known when it is possible for the flyer to be aware that he is turning—when he is not in a cloud.

The air speed can only be known with any assurance from the air-speed indicator, and no amount of experience can do more than approximate to this if there is any wind blowing, though a skilled pilot gets some idea of his speed being adequate by reason of the resistance he feels to the moving of his controls. For this he must, of course, be acquainted with the particular type of machine he is flying. Opinions differ as to the value of relying on the air speed indicator as against going by "feel," but from past experience and observation I think that the instrumental method is the better and safer, provided a reliable instrument is used and kept in order. The instrumental method is used to the exclusion of "feel" in all European countries.

Always, when the aeroplane gets out of control, the engine should immediately be throttled down or switched off. If at a reasonable altitude the aeroplane should be dived, but if there is no room for a dive there will probably be a smash in any case; it is accordingly better that the throttle is closed and switch "off" so that any danger of fire is avoided.

The problem is best considered separately on the unstable and the stable aeroplane.

Unstable Aeroplane With Speed Correct

The only way a spin can occur with the aeroplane at its correct speed (or higher speeds) is by the fin surface aft being too small or incorrectly disposed—one kind of instability in the aeroplane. Given the proper speed; whether the sideslip causing the spin is outwards or inwards, the inadequate fin area aft is the cause of the spin. The fin area is a matter of design, and the flyer's best course of action is advised in the treatment below; but in any case he can increase the effective fin surface aft by holding his rudder appropriately. When in a left-hand spin hold rudder to right or in R. H. spin hold rudder to left. Usually, when a flyer goes into an unexpected spin he is a bit confused, so it is advisable to make it a general rule to hold the rudder in the straight position.

Stable Aeroplane With Speed Correct

If the flying speed is correct and the aeroplane stable, sideslips correct themselves. This does not imply that foolhardy over-banking which produces the sideslips is allowable. Thus, if a sideslip be obtained by heavy banking without much turning, this means that the aeroplane, under gravity, sideslips towards the ground, and therefore the side wind comes on the flyer and on to the aeroplane in a direction upwards from the ground. This resultant "upwind" will be strong when the slipping is severe, and so the aeroplane will tend rapidly and strong to re-align itself into this side wind, thus overcoming the sideslip if there is space enough. Nevertheless, two things are to be noted in this connection:

(1) The rapid re-aligning of the aeroplane into the new direction will appear like the beginning of a spin, though it really need not be a spin; and—

(2) The flight path will be directed downwards, since the wind came upwards from the earth, and such a flight path is, of course, dangerous if so near the ground that there is not time enough to flatten out. Such a movement is not to be described as a spin, because the rotation is not continuous and ceases automatically when re-alignment to the relative wind has been achieved.

Unstable Aeroplane With Speed Too Slow

Six conditions may occur in various unstable aeroplanes:

(1) The fin surface aft may be inadequate minus above.

(2) The fine surface plus rudder may be inadequate.

(3) The rudder reaction may be too strong for the pilot to master.

(4) At very slow speeds the operation of the ailerons may produce spinning tendencies which the fin and rudder, though otherwise adequate, cannot counter.

(5) The fin surface may be too unsymmetrical above and below the body.

(6) The total fin surface aft (fin plus rudder) may be too great.

I will take all these cases and first consider sideslips outwards. In No. 1 the only general direction that can be given is that the rudder should be held straight and the aeroplane dived for speed recovery. (If the spin is so rapid that the angle of attitude of the rudder to the air approaching it is greater than 15 degrees, it would as a general rule be best to hold the rudder straight. It would seem that if the spin is caught before it has developed any great rapidity, the rudder may be turned in the direction which checks the spin and then straightened. As a rule the rudder should not be turned very much, and so for simplicity it is advisable to stick to the rule, "Keep the rudder firmly straight.")

In No. 2 the general instructions to the pilot are the same as in No. 1.

In No. 3 the general instructions to the pilot are that he must maintain the full pressure that he can exert toward keeping the rudder straight.

No. 4 is more complicated; the occasion when a spin can arise is when a turn is being made without enough bank, presumably because the aeroplane is so near the ground that there is danger of touching the ground with the lower wing tip, or else by reason of inexperience. Apart from any warping effect by the pilot, the mere fact that there is a spin, by giving the outer wing the greater speed, tends to lift it; this is supposed in the present case to be opposed by the pilot, who is for some reason trying to avoid a bank. This opposition is expressed by his pulling the inner aeleron down. If on this occasion the speed is too low (contrary to the effect at normal speeds) it *diminishes* the lift of the inner wing top and also adds largely to its resistance. Accordingly this wing is retarded and drops still more, much to the pilot's surprise, unless he has had lots of experience.

This has two effects: It tends to give the aeroplane its proper bank, but it also causes a rapid spin round the retarded wing tip. This type of spin persists, and as the bank increases the spin round the lower wing tip amounts to a nose dive, which itself would cure the loss of speed and so make all safe if there were enough ground clearance.

The general instruction to a pilot whose speed is at the stalling point is, therefore, to turn the outer aeleron down hard. This will retard the spin, and, if the aeroplane is really at the stalling point, will avoid banking the aeroplane. This may be easier expressed in another way by saying that the aeleron control effects are reversed at stalling speed.

(This is what should be done to remedy a spin, but the correct thing is really *NOT to let the speed get too low.*)

But, to continue, as soon as the aeroplane is straightened by this inverted action in the aeleron controls the engine should be opened full, trusting that the machine will pick up enough speed not to "pancake" too hard. This situation is in any case a bad one, and no pilot should attempt an under-banked turn with the aeroplane flying near its stalling speed.

Unluckily, this particular form of error is one which there are special excuses for falling into, and it occurs quite frequently, sometimes with fatal results. Thus, if the aeroplane is over ground that is too rough for landing and the engine cuts out, the pilot will naturally wish to do two things:

(1) Turn the aeroplane back to good ground.
(2) Or, if he is too low down, keep the machine up in hopes of being able to reach the good ground before he has descended too far.

Turning in itself causes a great loss of speed, and a consequent loss of altitude. Even an experienced pilot will often unconsciously keep an aeroplane up too much with the elevators trying to get in good ground, and at the turn he gets the spin and nose dive into the ground he was trying to avoid. The whole of these effects exists both in stable and unstable aeroplanes.

In No. 5 this mostly applies to small, fast aeroplanes having very large engines in relation to the size of the planes. When flying at power near stalling point the swirl of the slip stream is aggravated. This swirl affects the unsymmetrical fin aft, and thus a bank is imposed on the aeroplane at stalling point so that the same condition as No. 4 is imitated.

No. 6. This case is not usual. The effect of so large a fine area aft would be got only by adding to the fin the area of the rudder supposed to be held rigid. The result of the large fin (plus rudder) area is to re-align the aeroplane too rapidly into the direction of the wind, and the remedy is to reduce the fin area by letting go the rudder control. In all the above cases the one error is bringing the aeroplane down to a point near or at the stalling speed.

Stable Aeroplane With Speed Too Slow

I will first consider outward sideslips on each of the heads given in "Unstable Aeroplane."

Nos. 1 and 2 do not exist.

No. 3. The pilot must maintain all the pressure he can exert towards keeping the rudder straight.

The aeroplane will then try to recover flying speed on its own account. It should be remembered that speed recovery means coming towards the ground, or in bad cases diving, which is not always desired by a pilot who is already down low.

Nos. 4 and 5. Considerations are as in "Unstable Aeroplane."

No. 6 does not exist.

Inward Sideslip

Having dwelt at length upon outward sideslips on stable and unstable aeroplanes, I will now turn to inward sideslips on each class of aeroplanes. An inward sideslip occurs only while stunting, except in case the pilot gets into a fog or cloud where an aeroplane may be unintentionally held on a "bank" (by any experienced pilot) yet flown with the rudder in a straight position. This gives rise to the same results as an inward sideslip due to an overbanked turn. With an aeroplane having the stability of a J N 4 B (Curtiss) the first thing to do is stop the motor. The rudder should be held over to turn the aeroplane in the direction in which it is sideslipping and the elevator control shoved forward or down. This will cause the aeroplane to dive quickly and so gain speed. As soon as the aeroplane is moving nearly vertically downward, the rudder should be brought central and elevator pulled slowly back.

I have often confirmed the above experimentally in the air and avoided bad crashes. It is unnecessary to discuss under this head the cases Nos. 1 to 6, for which the only general instruction is that the aeroplane need never be brought to the point of flying too slow if the pilot attends to business and has an air-speed indicator.

Stalling and Flying Too Slowly

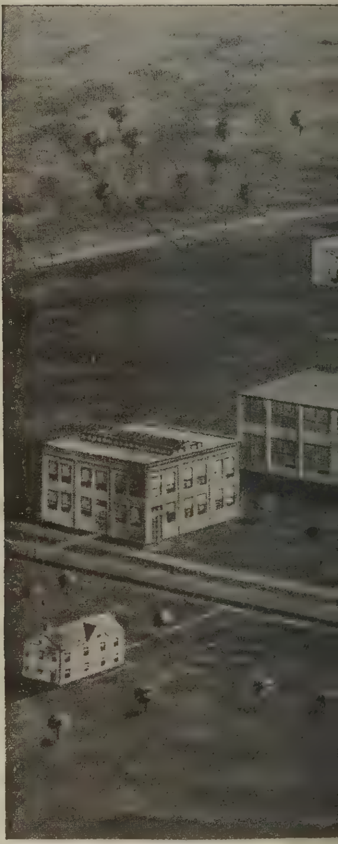
One of the chief reasons for stalling, other than that indicated by an unstable aeroplane with speed too slow, occurs when an aeroplane in sight of the ground turns round from flying against the wind into flying down wind. The stalling tendency arises because of the habit of estimating the speed of an aeroplane by reference to the ground; so when going down wind the aeroplane appears to the pilot to be flying fast, though really very near its stalling speed. Thus in a 38 m. p. h. aeroplane (here 38 m. p. h. is taken as being the speed at which many aeroplanes will just avoid being stalled) against a 20-mile wind an air speed of 38 m. p. h. is safe, and is obtained when the speed over the ground is 18 m. p. h., but after the pilot has turned down wind he is safe only when making a speed of 58 m. p. h. or more in relation to the ground. The great difference of speed over the ground (or ground speed) to secure the same air speed of 38 m. p. h. is very easily overlooked, especially if no air-speed indicator is used. In these two cases the aeroplane is traveling the same air speed, but when going down wind it *appears* to be going nearly *three times* the speed as when flying against the wind. No mistake would occur in the air speed if air-speed indicators were used as extensively here as in Europe.

The usual method of purposely getting into a stall in stunting or testing is to spiral, making the spiral smaller and steeper until a spin is developed.

I have treated the above spins as "spinning nose dives." Unless a machine is diving tail first and spinning I cannot see how it is possible to call it a "tail spin." I have never known of a man to come out of a real tail spin, because the elevators will be jammed by the air pressure and the tail would necessarily be too heavy for the machine to right itself.

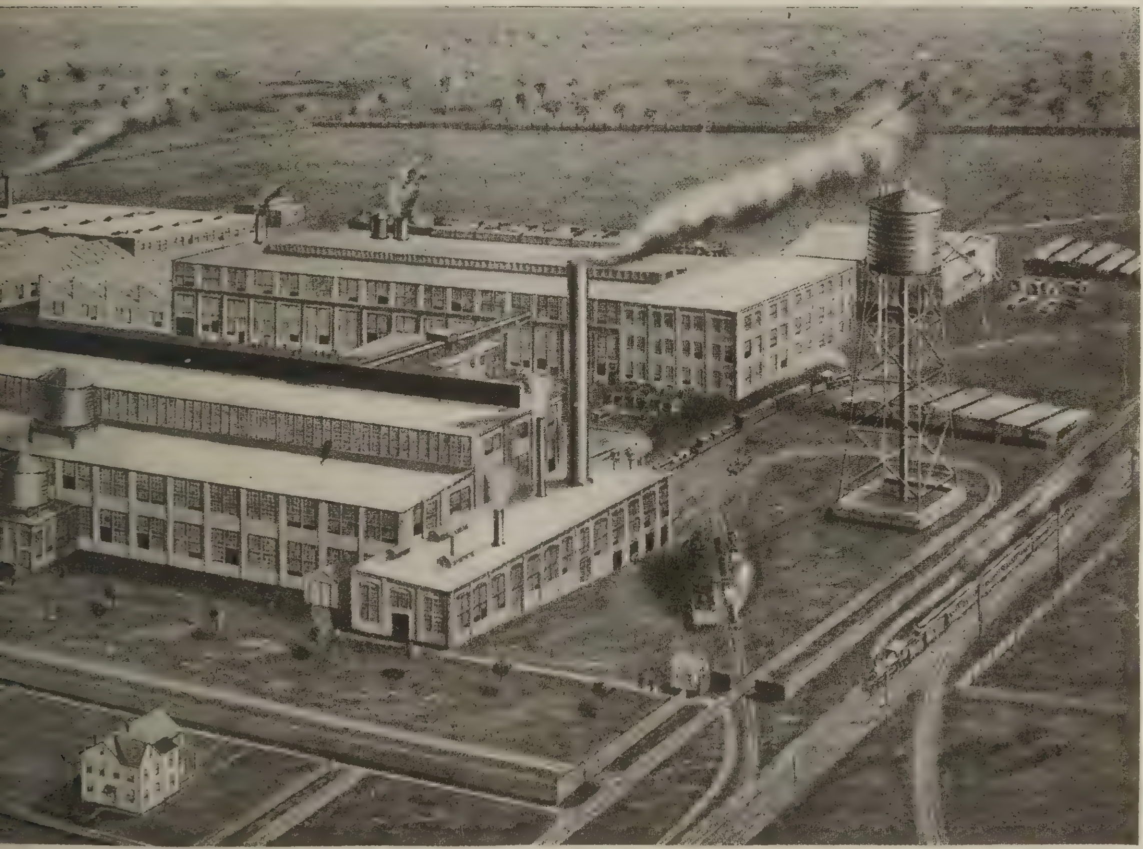
Lawson

M. T. 1
M. T. 2



First Lawson Aircraft Factory, April, 1917.

Second Lawson Aircraft Factory, December, 1917.



Third Lawson Aircraft Factory, April, 1918.

The Lawson Aircraft Corporation

Green Bay, Wisconsin

FOREIGN NEWS

AUSTRIA

On March 13th the Austrian official announcement reports the following aerial activity on the Italian front:

"In Venetia two Austro-Hungarian battle echelons in reprisal for enemy aerial attacks made an attack on the Italian aerodrome northeast of Mestre (a suburb of Venice). Four enemy pursuit echelons which were ready to set forth were surprised and bombed. One Italian airshed collapsed.

"On their return journey our aviators bombed Treviso and enemy trenches on the Piave."

FRANCE

According to the French official announcement of March 9th, two German aeroplanes were brought down on the previous day.

The official report issued on March 10th reports the destruction of several German aeroplanes, as follows:

"On March 9th two German aeroplanes were brought down by our pilots and ten others fell inside their own lines. It is confirmed that five German machines were brought down on March 6th and 8th. Our bombing aeroplanes carried out several sorties. Fourteen thousand kilos of projectiles were dropped on stations, cantonments and aviation grounds in the enemy zone, several fires breaking out."

Five enemy planes were downed and many bombs dropped, according to the French official announcement of March 11th:

"Yesterday five German aeroplanes were brought down or gravely damaged. Our bombing squadrons dropped 10,000 kilograms of projectiles on enemy stations and establishments in the regions to the north and east."

The French official announcement for March 12th states:

"On March 11th three German machines were destroyed by our pilots and a fourth was damaged severely. During the night of March 11th-12th three enemy bombing aeroplanes were brought down by the fire of our anti-aircraft guns."

Aerial operations are described in the announcement of the 14th as follows:

"During Wednesday a German machine was destroyed and three others were damaged severely, falling within their own lines."

The night report of the 14th says:

"During the day three German aeroplanes were destroyed by our pilots. It is confirmed that on March 9th Sub-Lieutenant Madon destroyed two German aeroplanes. Our aviators, in several sorties, recently carried out effectual bombardments, dropping 1,800 kilograms of projectiles on railway stations, works and aerodromes in the enemy zone."

The French official announcement for March 15th says:

"Last night our aviators dropped 5,640 kilograms of bombs on a number of railway stations and cantonments in the enemy zone."

The announcement of the 12th on Balkan operations says:

"Entente aviators carried out a number of raids and bombarded the enemy establishments in the region of Rupal and north of Monastir."

Reporting on Balkan operations, the official announcement of the 13th states:

"Bombing raids were carried out by Allied aviators against the railway line between Seres and Drama, on enemy depots in the Vardar Valley and against the railway station at Beranci, north of Monastir."

GERMANY

The German official announcement of March 10th states that:

"In the last two days twenty-eight enemy aeroplanes and one captive balloon have been shot down. The Boelke chasing echelon brought down its 200th opponent."

Reporting on operation of the previous day, the German statement of March 13th says:

"Vigorous reconnoitring in the air led to violent fighting. Yesterday we shot down nineteen enemy aeroplanes and two captive balloons. Cavalry Captain Baron von Richtofen achieved his sixty-fourth aerial victory."

Destruction of Allied aeroplanes in the operations of the preceding day are described in the official announcement of March 14th:

"Seventeen enemy aeroplanes and three captive balloons were brought down yesterday in aerial engagements and by fire from the ground. Of an enemy squadron flying toward Freiburg three machines were brought down on the front. Baron von Richthofen achieved his sixty-fifth aerial victory."

On March 17th the German official announcement says:

"Seventeen enemy aeroplanes and two balloons were shot down yesterday."

GREAT BRITAIN

On March 10th, British aircraft conducted a destructive daylight raid against the Daimler factories at Stuttgart. The official description follows:

"On March 10th Germany was again bombed by our planes in broad daylight. On this occasion the Daimler motor works at Stuttgart were attacked. Over one and a quarter tons of bombs were dropped. Several bursts were observed on the railway station, where a stationary train was hit and seen to be on fire.

"Three bursts were observed on a munition factory southeast of the town, and other bursts on the Daimler works and buildings around.

"Hostile machines made a weak attempt to attack our formation over an objective, but withdrew on being attacked. All of our machines returned except one, which had engine trouble and went down under control just before recrossing our lines on the homeward journey."

Successful combats and bombing activity are announced on March 12th, as follows:

"Three observation balloons were destroyed by our aeroplanes on Friday. Five German machines were downed in aerial fighting, seven were driven down and out of control, and one was brought down by infantry fire. Four of our machines are missing.

"More than 400 bombs were dropped on the Menin, Roulers, Ledeghern and Solesines railway stations."

The official night announcement of March 12th reports further bombing activity, and, among others, a very successful rail on Coblenz. The official description of the raid follows:

"There has been poor visibility, but over 500 bombs have been dropped on sidings and ammunition depots at Aulnoye, southeast Maubeuge, and other depots south of Valenciennes, southeast of Cambrai and south of Douai.

"On Monday we made the third daylight raid on Germany in four days. On this occasion factories, stations and barracks at Coblenz were attacked and over a ton of bombs were dropped. Bursts were seen on all the objectives, causing two fires, and a hit on a building in the southwest corner of the town created a very large explosion. Few enemy machines were encounterd. All of our machins returned safely."

An official statement on aerial operations issued March 13th says:

"On Wednesday afternoon nearly ten tons of bombs were dropped on munitions works and barracks at Freiburg, Germany. All our machines reached their objective.

"In addition to the raid reported in last night's official statement, over three tons of bombs were dropped on the docks at Bruges. On Tuesday bombing raids continued with greater vigor than on previous days. Over thirteen tons and a half of explosives were dropped on various targets, including railway sidings at Mons and Bavay, large ammunition depots northeast of St. Quentin and south of Douai and billets east of Lens.

"In the course of the fighting, which was continuous throughout the day, fourteen German machines were brought down and eight were driven down out of control. Six of our machines are missing.

"On Tuesday night seven tons of bombs were dropped on enemy billets between Lille and Cambrai."

Intense aerial activity is described in the official announcement of March 15th as follows:

"Aerial fighting was most severe, encounters occurring between large formations. Nineteen hostile machines were shot down and five others driven down out of control. Five of ours are missing."

"Seven hundred bombs were dropped on the enemy billets, ammunition dumps and railway sidings at Courtrai and Denain. Further reports of the raid on Freiburg say the bombs dropped were seen to burst on the railway station and around the power station. Just after bombs were released our formation was attacked by a large number of machines, the fight lasting until the enemy was forced to withdraw."

The announcement of March 17th says:

"On Sunday we again raided Germany, attacking the barracks and railway station at Kaiserslautern. Direct hits were observed on the station and a large fire broke out.

"Our formation was attacked by a large number of hostile machines, which were driven off. All of our machines returned.

"On Saturday thirteen tons of bombs were dropped on the enemy's billets, which have been bombed continuously for the last twenty-four hours, and two hostile aerodromes and three large ammunition dumps. At one aerodrome a hangar completely burst, and a Gotha machine in the act of rising was seen to crash.

"Sixteen hostile machines were brought down, and seven were disabled. Six of our machines are missing."

British aviators of the Naval Air Service on March 10th made a raid over Belgium, dropping bombs on the aerodrome and ammunition dump at Engel. Two fires were started. In aerial combats three enemy aeroplanes were destroyed and four others driven down out of control. All the British planes returned safely.

The text of the announcement of March 14th regarding the Naval Air Service reads:

"On Tuesday two British seaplanes attacked five enemy aircraft in the southern part of the North Sea. The engagement lasted thirty minutes. One enemy two-seater was shot down and destroyed, the observer of a second machine was killed and a third seaplane was driven down on the water.

"The engagement terminated when the British seaplanes had expended all their ammunition. Both machines returned safely."

On the Italian front "Five enemy aeroplanes were shot down, one by our own airmen, three by British aviators and the other by French anti-aircraft batteries. Our airships last night renewed their bombardment of enemy aviation grounds," says the official announcement of March 13th.

In co-operation with infantry, the British air forces inflicted heavy casualties on the Turks, according to the statement of March 11th.

"During the retreat the Turks were attacked by our aeroplanes with bombs and machine-gun fire at heights from 2,500 feet to under 100 feet. Heavy casualties were inflicted on the enemy."

ITALY

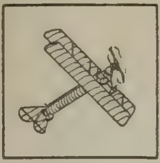
The Italian announcement of March 11th describes the aerial operations of the preceding day as follows:

"On Sunday our aeroplanes bombarded enemy aviation grounds. Other camps were bombed at night by five airships. A total of seven tons of bombs was dropped. All of our aircraft returned unscathed, notwithstanding the violent enemy fire. On the left side of the Piave British aviators brought down two hostile machines."

On March 14th the Italian official statement reports intense aerial activity.

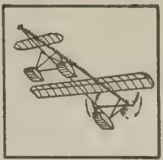
"On the plains the aerial activity was intense over the fighting line and over the immediate rear lines. Seaplanes of the Royal Navy droppd bombs on enemy stores, and the aviation grounds of the enemy were bombed by our airships. One enemy aeroplane was brought down."

Naples, more than 300 miles south of the battle line, has been bombed by enemy aviators. Whether the flyers came from the Austro-German front, from the Albanian coast, 250 miles to the east, or from submarines or other craft at sea is a mystery. The attack is the first to which Naples, the largest city of Italy, with a population of 600,000, has been subjected during the war.



MODEL NEWS

Edited by G. A. Cavanagh



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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Mr. Schweinsberg's Model

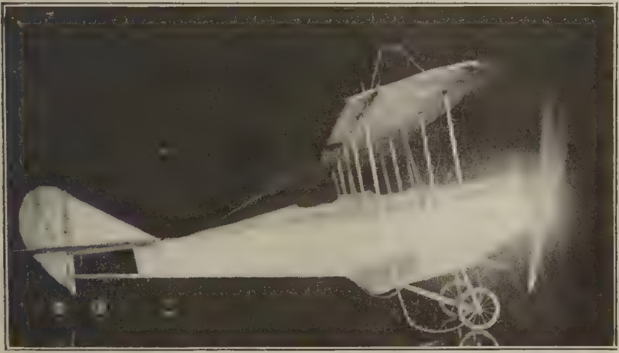
Mr. Ray Schweinsberg of Boonville, New York, sent us the following letter and photograph:

Enclosed you will find a picture of an old friend of mine. This model was built last year but has not yet flown. I have recently completed the motor tests and when the weather agrees she will take the air. I am building a 4½ foot Pursuit Plane model and I will send you a picture of it when done.

The racing model has never appealed to me. I like to make models as near large machines, with two restrictions. First, they MUST FLY. Second, they must not be so expensive that a smash will be more than a joke in time or labor. This model with its monoplane wings cost me about $10.00, as I carved the propeller myself. Then there are a few general construction rules:

> Don't use too many turnbuckles on flying models to make them look like the big ones. They are too heavy.
>
> Use spruce instead of reed on the straight wing edges. They are less likely to warp. Just before you make the corners you can join the reed with a sleeve.
>
> When you can, use tubing instead of solid rods, even for axles. They are nearly as strong and lighter.

In the pictured model I think I have used a rather new method of attachment of motor stick. The motor stick lies in the bed of the fuselage, beginning at about the deepest part of the machine and extending back nearly to the tail. The rear rubber hook is just back of the rear seat and nearly in the middle of the motor stick. The strain then comes upon all of the bottom struts, the greatest at the center, of the motor stick where they are properly braced. There is no warping and twisting of the body in this way when wound. I have spent a great deal of time in trying to persuade six foot models to take a full skein 3/16 flat without being thrown out of true. I think this is the solution.



A Unique Exhibition Model

This interesting model was made by Mr. M. S. Dunkelberger of Dayton, Ohio, particularly for store window display purposes.

The body is constructed of light tin and is 32 inches in length, containing a 110 volt electric motor for operating the propeller and the rear planes. Aviators are represented by ordinary dolls with headgears, which were cut from light leather, securely glued to their heads. A painted mustache makes them appear to be of fighting age. Windshields are of celluloid.

The propeller is 9" in length and was fashioned from poplar and given several coats of hot glue and shellac.

Wheels are of wood construction with rubber rings for tires.

The wing framework is of light wood and wire covered with linen doped with shellac. The top wing measures 6" x 39", the lower wings 6" x 12" each. Struts are of light wood and fit in small sockets, which are soldered to the wing framework. By cross wiring the wings they are made rigid and can be disconnected from the fuselage as shown by the enclosed photo.

The model is painted a war gray and lettered in black. Insignia on wings and fuselage is painted in the familiar red, white and blue. The rudder is also painted red, white and blue.

To complete the window display, Mr. Dunkelberger painted a scene representing a training camp "Somewhere Behind the Lines," and with green sawdust and sand transformed the floor into a good field.

In operating a flasher is used, which automatically starts and stops the motor, giving the onlooker a chance to see the construction of the propeller.

A Compressed Air Motor for Model Aeroplanes

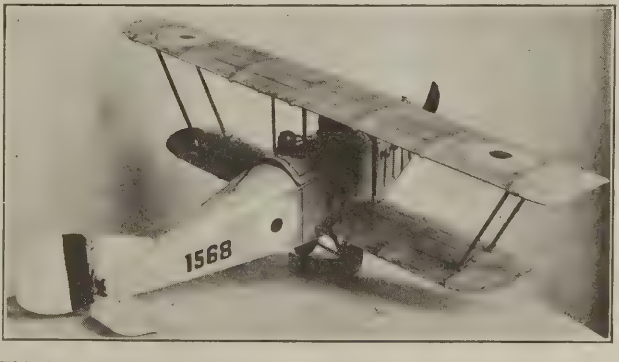
(Concluded from page 59.)

Assembling

As simple as this type of engine may seem, it nevertheless calls for carefulness and judgment, especially in the matter of assembling the various parts, for it is quite possible that a few finishing touches will be needed to enable the completed product to work efficiently. Patience likewise is essential to good results. First, see that the pistons function smoothly in the cylinders, then attach the cylinders one to the other by lapping over the other in the manner illustrated in Fig. 1-a, and solder into place. Through the center of the ends thus lapped a hole should be bored ¼" in diameter into which one end of the valve casing should be soldered. Inlet pipes can be formed from two pieces of brass tubing ⅛", Fig. 1, e, e, and after heated until soft should be twisted to a shape similar to that shown. One end of each piece of tube must be soldered to the end of a cylinder, while the other end should be soldered into the second hole of the valve shaft casing. Continue by inserting the valve shaft into the valve shaft casing and follow by springing the connecting rods onto the crankthrow. To protect the propeller from the end of the valve casing and at the same time serve as a flange for mounting the propeller a small metal disc should be soldered one-half inch from the end of the valve or crank shaft which protrudes from the end of the casing.

It is quite natural that the engine will operate rather stiff, but this stiffness can be worked out by oiling the various parts and working the engine in the following manner: Fix the engine to remain stationary, clasp the end of the crankshaft in the jaws of a drill and turn until the engine there is a minimum amount of friction. The final operation consists of connecting the engine with the tank. This can be done by using a piece of brass tube 3" long by ⅛" in diameter and bending it into an oval shape, as illustrated, Fig. 1, e. e. When the ends have been soldered into the holes nearest the cylinders, bore a hole into the tubing halfway between each end. Do not bore the hole through. To complete the work, cut off another piece of ⅛" brass tubing and solder one end to the inlet valve in the tank and the other to the hole just drilled.

In conclusion perhaps it is necessary that a little advice be given to the extent that too great a pressure should be avoided when first attempting to charge the tank with air, for it sometimes happens that the soldering is not complete, in which case undue pressure may cause unnecessary damage, which can be obviated if, after a slight charge, say, 10 strokes of the pump, has been given, the tank is carefully examined for possible leakage. And again, don't get discouraged if at first chance the engine does not perform as desired, for it may be necessary to readjust some of the parts, and by so doing the builder is afforded a splendid opportunity for cultivating inventive ability.



This interesting reproduction of a large military aeroplane is now being exhibited by Mr. Dunkelberger, in several large stores of Dayton, Ohio.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Important Notice!

A letter of great military importance has fallen into the hands of the Aeronitis editor, which proves that Germany has lost all hopes of winning the supremacy of the air.

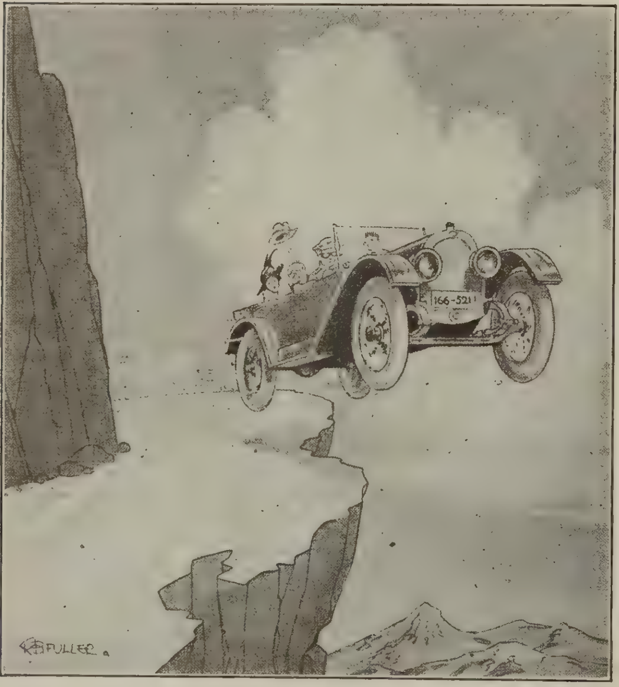
"DEAR MOTHER:

"Just a line to say that I have joined the *Verkhestruppen*[1] and by authority of the *General Inspektion des Militar-Verkhrsweseus*[2] was given a commission in the *Lufstreitkrafte.*[3] On reporting to the *Kommandierender-General der Luftstreitkraft,*[4] I was detailed to the *Fliegernachrichtenoffizier,*[5] who ordered me to the *Inspektor der Fliegabwehrkanone im Heimgabiet.*[6] The constantly increasing *Kampfeschwader*[7] of the Allies has greatly increased the work of our *Schutzstaffen.*[8] Although we have numerous *Seefliegerabteilungent*[9] and *Landliegerabeteilungen,*[10] they are far from sufficient. Allied *Feldfleigerabeteilungen*[11] and *Artilleriefliegerableilungen*[12] fly unmolested, protected by their *Jagdstaffeln*[13] and *Schutstaffen.*[8] Our best efforts are insufficient.

"FRITZ."

---

[1] Signal Corps.
[2] Chief Signal Officer.
[3] 3 Anti-aircraft division.
[4] Commander, anti-aircraft division.
[5] Intelligence Officer.
[6] Commander, interior air defense.
[7] Bombing squadrons.
[8] Defense squadrons.
[9] Seaplane squadrons.
[10] Aeroplane squadrons.
[11] Reconnaissance squadrons.
[13] Artillery spotting squadrons.
[13] Combat squadrons.



Lieutenant Flye, on furlough, forgets he isn't driving his aeroplane.
—Courtesy Life

A "HOOVERING" REPAST

MENU

CURTISS CAFE DE LUXE

SOUP	RELISH
Beverage a la Light	Aileron Tips with Carburetor Drippings
Consumme de Camouflage	Stewed Wing Beams

Assorted Indicator Parts

FISH

Salt Water Boneless Pontoon Floats—in Oil
Fried Nose Clips—Broiled Tail Skids
Dihedral Cut Stuffed Hull Fins a la Keelson
Aviator Fries—Brazed Longerons with Fuselage Dressing

ENTREES

Scalloped Tail a la Juice
Broiled Stabilizer—Cowl Sauce
Vertical Elevator Webs—Khaki Gravy
Stuffed Wing on Toast

DESSERT

Wind Pudding—Air Sauce
Skid Cake—Mahogany Filling
Frosted Wing Shields

All guests are requested to leave their angle of incidence with the head waiter.

ENTERTAINMENT

The Dixie Booster will render selections, accompanied by Mr. Water Rudder on a Reliance Tachometer, Miss Windum Tape has agreed to dance the Diagonal Strut for the first time in public. Upon leaving the cockpit take the Horizontal Elevator up to Station 6—present usual weekly gate pass upon entering.

"We'll Keep Flying"

Alonzo Newton Benn, a Chicago Athletic Association Member, Has Published a Patriotic Song Entitled, "We'll Keep Flying." It Was Especially Written for Cornell Alumni, and Follows:

We'll build a million avyplane,
  To fly across the ocean;
And when (s)hell-fire begins to rain,
  There'll be a big commotion.
We'll fly above the clouds so high,
  Hun guns our flight can't hinder;
And when we drop our bombs quite nigh,
  They'll hustle for tall timber.

We'll chase the boche back o'er the Rhine,
  They'll go all helter-skelter;
And march no more to goose-step time,
  As they hot-foot for shelter.
We'll pilot straight for old Berlin,
  To bomb the kaiser's palace;
And make him rue his hellish sin,
  Of burning church and chalice.

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY
Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

**Write for catalog
and samples of toothing**

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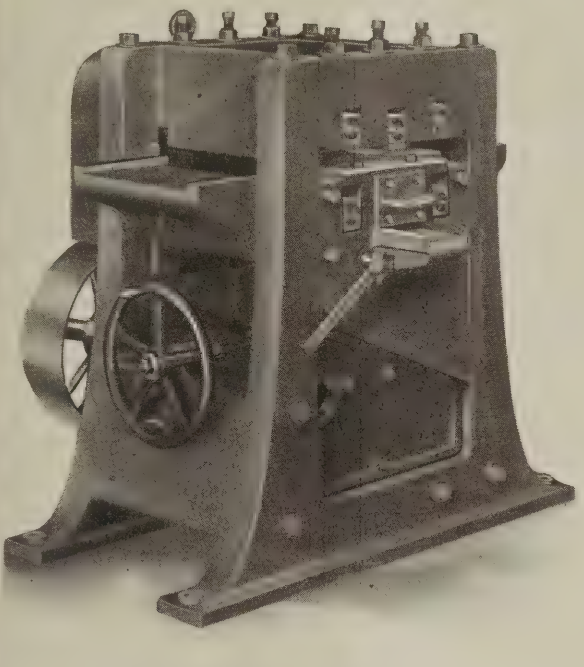
WINCHENDON MASSACHUSETTS



Whitney Scraping and Toothing Machine

Lafayette Flying Corps Honors Aero Club

The Aero Club of America has just received the diploma of the Lafayette Flying Corps, which has been awarded to the club for its patriotic service in collaboration with the Lafayette Corps. This beautiful engraving depicts the figures of Marquis de Lafayette on one side, and on the other the illustrious George Washington, first President of the United States. Aerial combat is shown in the sky, while below are the anti-aircraft guns firing amid the battle-scarred ruins of the devastated districts below.

This diploma has been given at various times to members of the corps for distinguished service and the Aero Club of America considers it one of its greatest honors to have received this recognition of the work it has done in giving its moral support to the corps and in assisting in sending many young men to France to fight for the cause which the whole nation is fighting for now, at a time when there was some hesitation on the part of the country as a whole in taking this momentous step and declaring war upon the German nation. The Lafayette Flying Corps has made a record of which America may well be proud, and which has strengthened the bonds of union between the Republic of France and ourselves.

The Honorary President of the Lafayette Flying Corps, Mr. William K. Vanderbilt, transmitted this diploma through Major Edmund L. Gros, the Vice-President of the Lafayette Flying Corps, and also member of the Foreign Service Committee of the Aero Club of America, which has been formed to keep in touch with American fliers in Europe, whether in the service and out of the service, and to keep the Aero Club of America informed as to their welfare, their needs and to render emergential aid to aviators, and to give their relatives and friends all available news of their welfare at all times within the necessary military restrictions. The American Ambassador, Hon. Wm. G. Sharp, is the Honorary Chairman, Mr. Laurence V. Benet, who has just been made a Chevalier of the Legion D'Honneur for his valuable and patriotic work in connection with the American Ambulance, is the acting Chairman, and Mr. Sidney B. Veit, one of the oldest members of the foreign colony, and for a long time on the Foreign Relations Committee of the Aero Club of America, is the Secretary.

The Foreign Service Committee of the Aero Club of America has arranged for the striking of the special war medal of the Aero Club of America, which was designed by the famous medallist Pierre Roche, who has lately been selected as one of the four artists to submit designs for a medal to be struck commemorating the entry of the United States into the world war. The special war medal of the Aero Club creates a new allegorical figure—an "Aero-maid," symbolizing aerial navigation by the pinions upon which she is borne, and, as the illustrious Pierre Roche intends, representing the tenth muse,—the "Muse of the Air." An inscription in Latin "Coeli Colis Stellarum Corona"—"To the heroes of the skies, a crown of stars" is most appropriate as it will be awarded for distinguished military service. Forty-eight stars, encircling the "Aero-maid," represent the forty-eight states of the Union, and thirteen, representing the thirteen original colonies, form the crown. This medal has already been awarded to Major Raoul Lufbery, the American ace, Major Wm. Thaw, to the families of the American volunteers, members of the Lafayette Corps, who have died for France and to the father of Captain George Guynemer, and to Lieutenant Charles Nungesser, of the French Army, Lieut. Ball of the British Army, Major William Avery Bishop, the Canadian flier, Captain Barraca, of the Italian Army and Lieut. Thierry of the Belgian Army.

The Foreign Service Committee has also distributed large quantities of tobacco, literature and necessities to the aviators at the various camps and those stationed in Paris, and they have sent clothing and money to the aviation prisoners in Germany, and have assisted in the arrangements made for sending Lieut. Henri Farre official painter of the French Army and Navy Aerial Warfare to this country, exhibiting a new school of painting, giving all those who see the paintings a realization of being in the air itself and being one of those taking part in the aerial combats which he so realistically depicts.

Research Information Committee, With Branches in London and Paris, Formed, Defense Council Announces

The following statement is authorized by the Council of National Defense:

1. By joint action the Secretaries of War and Navy, with the approval of the Council of National Defense, have authorized and approved the organization, through the National Research Council, of a Research Information Committee in Washington with branch committees in Paris and London, which are intended to work in close cooperation with the offices of the Military and Naval Intelligence, and whose function shall be the securing, classifying, and disseminating of scientific, technical, and industrial research information, especially relating to war problems, and the interchange of such information between the allies in Europe and the United States.

Organization of Committees

2. The Washington committee consists of—

(a) A civilian member, representing the National Research Council; Dr. S. W. Stratton, chairman.

(b) The chief, Military Intelligence Section.

(c) The Director of Naval Intelligence.

3. The initial organization of the committee in London is—

(a) The scientific attache representing the Research Information Committee; Dr. H. A. Bumstead, attache.

(b) The military attache, or an officer deputed to act for him.

(c) The naval attache, or an officer deputed to act for him.

4. The initial organization of the committee in Paris is—

(a) The scientific attache representing the Research Information Committee, Dr. W. F. Durand, attache

(b) The military attache, or an officer deputed to act for him.

(c) The naval attache, or an officer deputed to act for him.

Functions of Foreign Committees

5. The chief functions of the foreign committees thus organized are intended to be as follows:

(a) The development of contact with all important research laboratories or agencies, governmental or private; the compilation of problems and subjects under investigation; and the collection and compilation of the results attained.

(b) The classification, organization, and preparation of such information for transmission to the Research Information Committee in Washington.

(c) The maintenance of continuous contact with the work of the offices of military and naval attaches in order that all duplication of work or crossing of effort may be avoided, with the consequent waste of time and energy and the confusion resulting from crossed or duplicated effort.

(d) To serve as an immediate auxiliary to the offices of the military and naval attaches in the collection, analysis, and compilation of scientific, technical, and industrial research information.

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(e) To serve as an agency at the immediate service of the commander in chief of the military or naval forces in Europe for the collection and analysis of scientific and technical research information, and as an auxiliary to such direct military and naval agencies as may be in use for the purpose.

(f) To serve as centers of distribution to the American Expeditionary Forces in France and to the American naval forces in European waters of scientific and technical research information, originating in the United States and transmitted through the Research Information Committee in Washington.

(g) To serve as centers of distribution to our allies in Europe of scientific, technical, and industrial research information originating in the United States and transmitted through the Research Information Committee in Washington.

(h) The maintenance of the necessary contact betwen the offices in Paris and London in order that provision may be made for the direct and prompt interchange of important scientific and technical information.

(i) To aid research workers or collectors of scientific, technical, and industrial information from the United States, when properly accredited from the Research Infromation Committee in Washington, in best achieving their several and particular purposes.

6. The headquarters of the Research Information Committee in Washington is in the offices of the National Research Council, 1023 Sixteenth Street; the branch committees are located at the American Embassies in London and Paris.

(*Continued from page 10*)

Maloney, John Aloysius	SLR; KST
Maloney, Rupert L	OSU
Malone, William J	REL; GLC
McDonald, Hunter, Jr	FLT; CDT
Mackenzie, Clyde C	SLR
Meagher, Joseph E	SLR
Meany, John W	SLR
Minges, Henry V	SLR
Murphy, Maurice H	SLR
Maxwell, Robert R	SLT; CDT
McChesney, Samuel Hatton	SLR
McKinney, Edward C	SLR
McNicholl, Patrick J	SLR
Morrison, Jay	SLR
Munn, John Christy, Jr	SLR; RSD
Mann, Merrill Dietz, Jr	SLR; RWT
Mack, Donald Leslie	SLR; KST
Meyen, Bert Paul	SLR; KST
McClintock, John	PUP
McIntyre, Clifford S	SLR
Magowan, David W	SLR
Morris, George W	SLR
Muehlman, Ralph E	LHV
McDonough, Harry Lester	SLR; RSD
McDowell, Robert Newton	SLR; GLC
McCarthy, Emmett J	FRF
MacLure, Henry Goldsborough	SLR; THT
Mahon, Rennie Jackson	SLR; THT
Murphy, Robert E. Lee	SLR; THT
McCarthy, Aquilla Brown	SLR; THT
Morrow, Emmet R	SMM
Marshall, Thomas Holland	SLR; RSD
Myers, John Albert	SLR; THT
Moriarty, Louis Philip	SLR; RSD
Miles, Paul Keiter	SLR; MIT
McMinn, Wiley William	SLR; KST
Mills, Niles Easton	SLR; KST
Marr, William M	CPR
Moran, John R	SLR
Morse, Charles L	SLR
Marquardt, James Calder	FLR; THT
McLaughlin, Cornelius Dennis	CPR; AGC
McQueen, Bruce A	Note 1
McCutcheon, Mack D	Note 1
McGehee, James Edmond	FLR
Maw, Herbert B	FLR; Note 1
McInerney, John	LHV; Note 9
Merrill, William F	Note 14
Mason, Joseph J	FLR
McDonald, Edward K	FLR
Moore, Lewis E	SLR
Murphy, Maurice Harry	SLR; RSD
Meade, Evard K	OSU
McCormick, Cyrus, Jr	SLR
McLaughlin, Henry P	SLR
Moore, Edward S	CSO
McNicholl, Patrick John	SLR; LHV
McCormack, Joseph	WDO
Myerscough, Joseph	EI
Morrison, Jay	SLR; CMV
Meany, John Wynne	SLR; GLC
McKinney, Edward C	SLR; CSO
Merrick, Louis M	SLR
Moore, Charles Terry	CWT
McNeil, Chauncey St. C	DAF
Meagher, Joseph Edward	SLR; RSD
Mackenzie, Clyde Cameron	SLR; EHT
Minges, Henry Valentine	SLR; LDT
McDonald, Raymond A	BST

N

Niedermeyer, Frederick W	FRF
Newport, Charles Loan	FRF; SLR; THT
Nahm, Edwin Huttig	SLR; GIT
Norton, William Michael	SLR; CAF
Nevin, John, Jr	SLR; DIK
Noel, Sidney Q	SLR; THT
Newkirk, George Harold	SLR; THT
Noonan, Thomas Francis	SLR; THT
Neely, Harold Richard	SLR; KST
Nordeen, Ansel G	SLR
Nugent, Leo J	SLR
Nelson, Fred C	FRF
Nowland, Bob E	FLR
Nathan, Thomas Cushman	FLR
Nordeen, Ansel Gilbert	SLF; EHT
Nugent, Leo John	SLR; EHT

O

O'Connell, Joseph H	REV
O'Connor, Arthur James	SLR; MSC
O'Gorman, William S	SLR
O'Leary, Arthur T	CSO
Owens, William Allen	SLR; CAF
Owen, Richard, Jr	SLR
Ogden, John Wilmot	SLR; THT (1)
Outcalt, Dudley M	SLR; RSD
Ogilbea, Charles Augustus	SLR; FOB
Offutt, Magruder W., Jr	SLR
Oley, Willard S	SLR
O'Gorman, William	SLR; EHT
Oaks, Nathan P	GLC
Owen, Richard, Jr	SLR; KST
Otto, Charles D	SLR
O'Brien, Joseph D	CAF
Olsen, Clarence Albert	SLR; RWT
Organ, Vernon C	SLR; RSD

P

Parsons, Theodore Dwight	SLR; THT (1)
Parsons, Fay W	SLR; CWT
Pierce, Leslie Edward	SLR; THT (1)
Pearce, Henry George	FLR; CMV
Pegram, Walter M	DIS
Purcell, William Lawrence	SLR; EHT
Parmer, Oscar Sylvester	SLR; EHT
Peyton, P. Barbour	REL; RTR
Pearson, John Thomas	SLR; CAF
Penney, Thomas, Jr	FRF
Perry, Orlando Hart	CWT
Patterson, Robert Wortman	SLR; CAF
Paul, Frank M	FRF
Patton, Reginald W	SLR; CRI
Powell, Archibald Weaver	SLR; CRI
Parry, Maxwell Oswald	SLR; THT
Pond, George Kimball	SLR; EHT
Pond, Richard E	SLR
Pyne, Meredith H	SLR
Porter, Mark L	SLR
Porter, Charles Pullman	SLR; THT
Peck, Arthur H	SLR
Paige, Clarence G	SLR
Post, Speed L	SLR

Were All Your Grinders, Drills, Lathes, etc., Working for Uncle Sam's Aircraft Program Last Month?

Maximum Production
Made Possible
Through Intensive
Co-operation in
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Engine Factory

If they were not working every available hour it is your duty to make your capacity known to the aeronautic concerns that are under contract to the Government—that are helping Win the War in the Air for the Allies.

Ask our CONTRACT WORK DEPARTMENT how you can help.

AERIAL AGE
WEEKLY
280 Madison Ave.
New York City

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Powers, Harry J., Jr	SLR
Pope, Arthur B.	FLR; CDT
Phelps, Robert L.	FLR; CDT
Parkin, Carl W.	SLR
Pyne, Herbert R.	SLR
Parker, Troy La Salle	FLR
Poindexter, Erly W., Jr	FLR
Perry, William H.	SLR
Pierce, Walter G.	SLR
Pond, Richard Empey	SLR; DIK
Parish, Hayward C.	FRF
Piage, Clarence Grant	SLR; RWT
Powers, Harry Joseph, Jr.	SLR; RSD
Presley, Curtis E.	SLR
Pogus, Davenport	FLR
Peck, Arthur Hunter	SLR; MIT
Pyne, Meredith Howland	SLR; DIK
Pyne, Percy R.	FLR
Post, Speed Lemon	SLR; RSD
Porter, Mark Leslie	SLR; MIT
Page, Richard M.	Note 5
Presmont, Arthur N.	Note 7
Popperfuss, Henry J	FLR
Patrick, Charles D.	FLR
Pike, John	SLR
Pfaff, Leo G.	Note 1
Peck, Allen E.	FLR
Pearce, Henry G.	AGC
Pyne, Herbert Rivington	SLR; GLC
Parkin, Carl Wilson	SLR; RSD
Pickrell, Floyd N.	DIK
Piercem, Walter Griffin	SLR; PFO
Perry, William H.	SLR; LHV

Q

Quin, Langdon C.	SLR; CAF
Quinn, Orlo H.	UTA

R

Rowe, Ralph Sterling	FLR; GLC
Russell, Donald C.	FLR; THT
Russell, Robert H.	SLR; MIT
Russell, Herbert O.	FLR; EHT
Russell, Everetta Pickett	SLR; FOB
Roberts, James Price	SLR; FOB
Roberts, George B.	FLR; VBW
Richards, Marcus Dimmitt	SLR; EHT
Richards, William E.	SLR; CAF
Richardson, Durston Gardiner	SLR; GLC
Robinson, Clark	SLR; EHT
Reasoner, Nathan Robert	SLR; FOB
Ridgely, Arthur Oertly	SLR; FOB
Randall, Merwyn C.	SLR; MIT
Ratcliffe, Fred A.	SLR
Randolph, Robert J.	CSO
Rodman, Sheldon Livingston	SLR; CWT
Raiguel, William Otis	SLR; EHT
Ryan, Arthur William	SLR; EHT
Ramsey, John W. L.	SLR; EHT
Reber, Alvin David	SLR; LDT
Ruggles, Francis Washington	CWT
Roby, Townsley N.	SLR
Rice, Chester A.	SLR; THT
Rabe, Louis William	SLR; THT
Rule, William G.	FRF
Richman, G. Raymond	RSD
Ridgely, Joseph D., Jr.	SLR
Reed, Edward Everett, Jr.	FLR
Reubelt, John W.	SLR
Reynolds, Harry I.	SLR
Rushmore, William R.	SLR
Rollins, Richard	SLR
Rowland, John C.	SLR
Royer, James A.	SLR
Roehlk, John	SLR; DIK
Roby, Townsley Newton	SLR; DIK
Reddy, James V.	DIS
Rawley, Joseph	SLR; MIT
Raines, Thomas F.	CPR
Ramsey, James N.	Note 17
Rushing, Billy Glenn	FLR
Rockwell, George, Jr.	SLR
Riblet, Philip De Walt	CUI
Rutter, William M.	CPR
Rogers, Harold F.	FLR
Reese, William H.	SLR
Regan, William N.	SLR
Reubelt, John Warner	SLR; LHV
Reynolds, Harry Irvin	SLR; LHV
Rushmore, William Riley	SLR; LHV
Rowland, John Culhane	SLR; EHT
Royer, James Andrew	SLR; RSD
Rollins, Richard	SLR; DIK
Ross, Dunning H.	SLR
Russell, Frank L.	SLR

S

Smith, Claud B.	FRF
Smith, William W.	SLR
Smith, Warner G.	SLR
Smith, Z. Montford	FLR; CSO
Simon, Herbert Jerome	FLR; GLC
Simon, Louis Charles, Jr.	SLR; THT
Simon, Francis May, Jr.	FRF; SLR; THT
Simonin, Frederick Lovell	SLR; CAF
Sanders, John N.	SLR; AGC
Saunders, Isaac H.	REL; PFO
Slater, Francis G.	SLR
Scanlon, John Leo	SLR; CAF
Shillingford, George Webb	SLR; CAF
Sholts, Forrest H.	REL; CSO
Snyder, John A.	FRF
Slade, Russell C.	SLR; EHT
Sheehy, Maurice William	SLR; CRI
Spencer, Carlton Ernest	SLR; CRI
Street, Charles Edward, Jr.	SLR; CRI
Stevens, Samuel Stanclift	SLR; CRI
Sutphen, Edward Arthur	SLR; KST
Schafer, John Henry	SLR; EHT
Stedman, Jacob Cox	SLR; EHT
Scribner, Carelton S.	FRF
Seaman, William Laurie	SLR; LDT
Strickland, Chauncey Julius	SLR; THT
Schock, Leland Durwood	SLR; THT
Shawhan, Romer	SLR; THT
Shepherd, John Eldon	SLR
Shattuck, Ray Atwood	SLR; FOB
Seward, Charles Dee	SLR; THT
Stalker, Thomas Arthur	SLR
Stevens, John Hulett	SLR; THT
Stone, Thomas W.	FLR; CDT
Sullivan, James H.	SLR
Steiner, Harold Arnold	SLR; THT
Sides, Jacob S.	RSD
Saunders, Walter L.	CSO
Seitz, George Howard	CSO
Severin, Shirley	CSO
Stocking, Charles D.	SLR; DIK
Stephenson, Arthur B.	DIK
Stratton, George M.	REL; RSD
Shepherd, John Eldon, Jr.	SLR; CSO
Simrall, William F.	REV
Strawn, Ferdinand M.	FLR
Smith, William S.	DIK
Speer, Dallas Moss	SLR; KST
Stalker, Thomas Arthur	SLR; KST
Searl, Edward L., Jr.	RSD
Steele, John Lyle, Jr.	DIK
Stevenson, William F.	CSO
Schneider, Harry F.	SLR
Surface, Morris E.	SLR
Swanson, George W.	SLR
Swanson, Archie D.	SLR
Strickland, Chauncey J.	FRF
Smith, William Wellington	SLR; PMT
Smith, De Witt C., Jr.	CPR
Smith, Warner Gifford	SLR; MIT
Smith, Hugh L.	SLR
Smith, Landis S.	SLR
Smith, Leonce H.	SLR
Smith, Henry Charles	FRF; SLR; THT
Simonson, Floyd Louis	SLR; MIT
Sultan, Walter David	SLR; MIT
Seifert, Frank W.	SLR
Souza, William B.	SLR
Stevenson, Francis L. L.	SLR
Sullivan, Daniel J., Jr.	SLR
Smoot, Harold Reed	FLR; CSO
Steil, Fred Horr	SLR; KST
Snyder, W. Hill	SLR; DIK
Schnur, Philip B.	FRF
Stearns, Francis Ardell	SLR; RSD
Stanton, Charles Ingram	SLR; KST
Simons, William Lucas	SLR; CAF

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AERIAL AGE
WEEKLY

Vol. 7, No. 3 APRIL 1, 1918 10 CENTS A COPY

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British naval vessel taking gasoline to a seaplane compelled to descend for want of fuel.

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VOL. VII NEW YORK, APRIL 1, 1918 No. 3

CONVERT $3,000,000,000 OF LIBERTY BONDS INTO WARPLANES AND THE ALLIES' VICTORY WILL BE ASSURED

"THERE is only one weapon that can outdistance and destroy whatever weapon the Germans may be using against Paris, and that is the battleplane. We must extend our manufacturing facilities by using plants that are practically idle for lack of orders and proceed as fast and as far as we humanly can with an air program substantial enough to insure continuous delivery of aircraft in substantial number.

"As the situation stands, aircraft manufacturers have no orders to look forward to and some are not working to their full capacity.

"The Air Service is without funds with which to expand; it has been for a number of months; therefore, we are still working on the air plans made at the time when Italy was victorious and Russia was fighting, and there are not even the necessary funds to hasten this plan.

"It is up to Congress to act, and unless it does act promptly we will lose all possibilities of making ourselves felt in the air this year—and may pay a heavy price for our failure to act.

"The sum of $3,000,000,000 is needed for the Air Service, to provide the two machines per aviator needed for training and a minimum of six machines per man per year to keep them fighting. It makes a total of 80,000 aeroplanes and about 250,000 motors that we must provide to train and equip ten thousand aviators.

"We should have started at least six months ago, when Italy began to suffer losses and the Russian collapse became evident. We must lose no more time. The matter is too vital to the welfare of the Republic and the cause of the Allies."

Thus Mr. Alan R. Hawley, the president of the Aero Club of America, summarizes the situation.

We must act, and act promptly. Every person can help by subscribing to the coming Liberty Loan. Liberty bonds, converted into warplanes, will win the war.

GENERAL WOOD, BACK FROM FRANCE, URGES RUSH IN BUILDING AEROPLANES AS ONE OF THE MOST ESSENTIAL FEATURES TO WIN THE WAR

JUST back from the fronts, General Leonard Wood, the father of the National Preparedness movement, urges rush in building aeroplanes as one of the most essential features

Just back from the fronts, General Leonard Wood, the father of the National Preparedness movement, urges rush in building aeroplanes as one of the most essential features to win the war.

This recommendation was made to the Senate Committee on Military Affairs on March 25.

The New York *Times* gives the following resumé of General Wood's testimony and advices:

"Members of the committee were amazed when General Wood told them that not one American aeroplane was in use by the American forces in France. America has been supplying machines to England, but has not shipped any to her own men. The Germans have the ascendancy in the air over the American sector, the General said, the Americans being entirely dependent upon what machines the French are able to give them.

"Associated Press dispatches from the American front telling of the freedom with which German aeroplanes flew over the American lines, owing to the lack of American aeroplanes with which to combat them, were confirmed by General Wood. The French fliers on both sides of the American sector have been protecting the American front against enemy airmen, the General said, but at times they are too busy elsewhere to afford adequate protection, with the result that the German aeroplanes have absolute freedom. At times, he said, the Germans flew so low that the Americans were able to fire at them with revolvers.

"General Wood urged that America rush the work of building aeroplanes as one of the most essential features of its part in the war. He spoke of 1,000 American airmen being with the American forces, but with no machines of American make to fly.

"In reply to questions put to him by the committee, General Wood said the new Liberty motor was regarded by experts in France as unsuited to combat machines. Its utility, the experts believe, according to the General, will be confined chiefly to machines used in bombarding. He urged that parts of aeroplanes be shipped to France and aeroplanes made there.

"General Wood declared that, although there were no American heavy guns or shells of any character to supply the American forces in France, the French and British were able to make up the deficiency. While advising that America ship guns and munitions to France, he said that no handicap would result to the American troops so long as France and Britain could keep up the supply, and they were able to do it indefinitely.

"With a much greater American army in France, entailing increased demands for guns and ammunition, the General said, America would be called upon to furnish an appreciable part of her own ordnance. But for the immediate army and for the number of men apt to be in France in the next few months there are plenty French and British gun and shells.

American Morale Superb

"The General referred to the morale of the American troops as superb. The men have quickly adapted themselves to their new environment, he said, and make superior soldiers. They compare most favorably with the veteran French and British fighters.

"In commenting upon the disappointment of the French and British over America's lack of preparedness, General Wood explained that they had thought America, with her vast resources, would give a powerful impetus to the allied fighting machine. America had been depended upon not only for ships, but aeroplanes, while it was believed that if men were needed they would be forthcoming. The Allies were surprised, he said, that it took the United States so long to get into her fighting stride.

"Ships, and more ships, the General said, were necessary to win the war. Tonnage is required not only to transport American troops, he said, but to convey their supplies, as well as supplies to the Allies.

"General Wood gave confidential data to the committee bearing upon the necessity for ships and men. Asked by a member of the committee if he favored compulsory training for Americans between the ages of 19 and 21, the General replied that it seemed 'sound.'

"Men, ships and artillery, in the order named, the General is said to have stated, are the principal military needs of the Allies from America. In urging the necessity for more ships, General Wood criticized the present shipping arrangements, and said he had suggested to the War Department that fast and slow ships be segregated in the convoys, so that fast ships would not be held back by the slower vessels.

"The breakdown of Russia has greatly improved the morale of the German Army and the German people, General Wood said. He added that America should pay more attention to the Italian situation, and suggested that Americans of Italian origin be sent to Italy to combat the German propaganda, which has been active in that country.

"'General Wood fully discussed the situation from the time he left this country up to his return,' said Chairman Chamberlain, after the conference. 'He felt that the American industrial program should be pushed and not slackened in the least. He thought, also, that more raw materials might be sent abroad to be manufactured in France, and that, I understand, is the policy of the War Department—to increase shipment of raw articles for French manufacture.'

"Strengthening of the Army General Staff also was urged by General Wood. So many former experts on the General Staff, he said, have gone to France that, while General Pershing has a splendid staff, the War Department has been depleted and should be built up for advisory purposes."

GUN OR AERIAL TORPEDO?

IS it a gun or an aerial torpedo that is shelling Paris?

The latter seems more probable. The Aero Club of America authorities explain why as follows:

"It does not seem possible," said Mr. Alan R. Hawley and Henry Woodhouse, "that a gun has been developed that will have a range of more than thirty miles. There are fundamental factors upon which long-range gunnery is based. To get long range there must be a very high muzzle velocity, which depends upon the kind and amount of explosives used.

"The effect of a large charge of explosives is an enormous recoil. It would seem that if extraordinary guns had been developed able to shoot seventy miles, the recoil would be so enormous that the gun would be rendered useless after a few shots. It is inconceivable that such a gun has been developed.

"But it must be remembered that the inventive genius of the world has been mobilized and we must expect certain new instruments. We find that the shelling of Paris may have been done in any of four ways.

"A new, gigantic long-range gun hidden in forests within thirty-five miles of Paris could be used. It does not seem possible the enemy could hide a weapon so close, however.

"Large aerial torpedoes equipped with wings, launched into Paris from almost any distance, possibly guided by wireless control, could be the explanation. A great many wireless and motor-driven torpedoes have been invented.

"Aerial torpedoes could have been dropped from a height of more than 25,000 feet, so high the machines from which they were dropped could not be seen. The Germans have been developing light aeroplanes for high altitude work. This would account for some of the shells hitting Paris in different sections of the city. The course of such torpedoes would be changed considerably by air currents on the descent.

"Aerial torpedoes, especially built, could be shot from the huge German aeroplanes equipped with four motors, reported as being under construction in recent despatches. Shooting aerial torpedoes from a height would require little muzzle velocity."

The club authorities declared they believed the report that the Germans were shelling Paris from a distance of seventy miles was untrue and was being circulated to detract attention from the actual means employed.

FRENCH SEE NEED FOR INDEPENDENT AIR SERVICE FOR MAJOR AERIAL OPERATIONS AGAINST GERMANY

ONE of the consequences of the recent air raids on Paris, according to a special dispatch to the New York *Times*, has been a demand for a more aggressive policy against German air bases, such as was suggested to *The Times* correspondent by prominent aviation officers at the Belgian front last November. It is beginning to be realized that reprisal raids on the nearest German towns are unlikely to deter the enemy from bombing the French and British capitals. The only effective reprisals would be against Berlin, which is at present beyond reach of attack by an adequate air force.

An evidently inspired article in Premier Clemenceau's newspaper today makes the direct assertion that Germany's whole object in the Paris raids is to force the withdrawal of allied aeroplanes from the front in the hope of redressing her own inferiority in the air, which is daily growing more evident. In proof of this last assertion the writer compares the figures of the destruction in recent weeks of allied and German aeroplanes, and says, (italicizing the words:) "On point of military importance in the war zone ten bombs are dropped by allied aeroplanes for every one dropped by the Germans."

The correspondent is informed that part of Air Minister Dumesnil's statement before the Army Committee of the Chamber of Deputies concerned action against enemy airdomes. In the last two raids strong French bombing squadrons attacked the "nests" from which the Gothas set out, and apart from the destruction of hangars, barracks, and repair shops, the ground on which the Geman machines had to land was thoroughly plowed up by bombs, the measure of whose efficacy will be readily admitted by any one who has experienced the difficulty of a night landing in the best of circumstances.

There is also a suggestion in L'Oeuvre from Deputy Flandin, a member of the Army Committee, who has always paid special attention to aviation, which may well be a consequence of Dumesnil's statement. M. Flandin strongly advocates a regrouping of all aerial activities into a separate service as free from purely military control as the navy. He says:

"Why not constitute an independent high command and a General Staff of the air army to organize the war in the air just as the army and navy chief direct operations on land and sea? Their action would enable us to oppose the enemy's program of intimidation by an energetic scheme of a counter-offensive. There is no better means of protecting Paris against new attacks."

On similar lines was the following statement made to the New York *Times* correspondent yesterday in the lobby of the Chamber by an ex-Minister:

"I learn that a great measure of the recent British air successes has been due to improved organization as the result of the formation of naval and military aviation forces into what might be termed an autonomous service. It is for us to take a leaf from the English book and recognize that the war in the air may be even more decisive than operations on terra firma. At any rate, it seems the only direction in which we are likely to have marked superiority over the enemy this year."

At this date, when support in the air is awaited here as one of America's greatest contributions to the allied effort, this question of air service autonomy is no less important to America than to France or England. Now is the time to plan our organization instead of waiting, as our allies have done, until forced to do so by the pressure of circumstances.

THE NEWS OF THE WEEK

House Committee Reports on Naval Aviation

A special committee of the Committee of Naval Affairs of the House of Representatives reported on the Naval Aircraft situation as follows:

"We have examined the naval aircraft situation and find many matters of great interest, but much of our information is not now open for public discussion. This was the one development of material which no amount of foresight would have enabled the Navy to prepare adequately. The growth of aeroplanes and hydroaeroplanes has been so rapid that nothing short of actual war conditions would insure a large number of up-to-date machines with aviators trained to handle them. In the earlier stages of its undertaking the Naval Air Service met many discouragements, but the perfection of the Liberty motor and the use of large sums of money in conjunction with the Army to finance manufacturers have, under the direction of the Air Service, produced results that promise to meet the requirements of this important branch of the Navy."

E. C. Bass Marries Daughter of Baroness De Montaru

Mr. E. C. Bass, a well-known English aviator, who has been engaged for the last two years in important experimental aviation work in the United States, married Miss Xenia Greville Moore, daughter of the Baroness de Montaru.

Mr. Bass, who is registered as hydroaeroplane pilot No. 9 by the Aero Club of America, was one of the first to experiment with the Curtiss flying boat and, with Glenn H. Curtiss and John D. Cooper, took the first flying boat to England in 1913. Mr. Bass was closely connected with the development of the British submarine-chasing flying boats early in the war. Recently he has been working on a camera gun, which is capable of taking 750 pictures per minute.

Congressman Aviator in Aero Accident

Ex-Congressman La Guardia, now a Captain in the American Air Service, was injured in an aerial accident, according to a message from Rome.

Patriotic Meeting in Carnegie Hall Under Aeronautic Committee of Woman's Naval Service

A lecture by Capt. R. Hugh Knyvett, entitled "Making the World Safe for Democracy," was delivered at Carnegie Hall Friday evening, March 22, under the direction of the National Aeronautic Committee of the Woman's Naval Service.

Captain Knyvett is an Australian and has seen three years of active service at the front in Egypt, Gallipoli and France. He is now in America on leave, recuperating from wounds received from German bombs at Bapaume.

The members of the aeronautic committee of the Woman's Naval Service are Mrs. E. H. Harriman, Mrs. Clinton Gilbert, Mrs. Melvin L. Bronson, Mrs. William E. Benjamin, Mrs. Horatio N. Slater, Mrs. French Vanderbilt, Mrs. William H. Crocker, Mrs. Marshall Russell, Mrs. Benjamin Thaw, Mrs. Charles H. Whitman and Mrs. Henry Wise Wood. Mrs. Charles A. Van Rensselaer is chairman.

Big Plants Insure Against Aeroplane Bombs

The big gas and electric lighting companies of New York have arranged for insurance in excess of $50,000,000, covering bombardment from the air or the sea and other forms of war risk.

$40,000,000 worth of the total insurance has been taken by the Consolidated Gas Company, whose plant comprises one of the most valuable properties in the city. From $7,0000,000 to $10,000,000 has been taken by the New York Edison Company. $3,000,000 is said to have been taken by the United Electric Light and Power Company, although the correctness of this sum has not been confirmed.

In their decision to insure against loss from enemy attack, the big lighting companies have followed the example of a number of other large New York concerns who since the outbreak of the war have insured themselves against invasion to an extent, estimated by Howard P. Moore, Assistant Secretary of the Home Insurance Company, at close to $200,000,000.

The number of applications for this form of protection coming to the insurance companies has been constantly increasing the past few weeks. Mr. Moore ventured that there were at least a dozen concerns in New York carrying from $2,000,000 to $5,000,000 in war risks.

Navy Department Tests Liberty Motor

The first Liberty motor to reach Washington in actual service has arrived, driving a navy flying boat from Norfolk and carrying the pilot and two passengers. The trip was made in approximately two hours, despite the fact that the boat got off the 175-mile course mapped out, and covered a considerably greater distance. No trouble whatever was experienced with the Liberty engine.

The boat, one of the smaller types for sea service, has not been placed on exhibition while here. Navy officials are highly satisfied with the performance of the motor, however, and further long-distance tests are to be expected.

The crew of the boat accompanied department officials on an inspection trip today to witness the performance of the larger type flying boat equipped with two Liberty motors.

The navy type Liberty motor is not fitted to develop the same power as the type used in land machines. Flying boats or hydroaeroplanes are not designed to maneuvre at the high altitudes of the army craft and the same piston compression is not necessary. The Liberty supplies 50 horespower in excess of the estimated needs for the navy air service.

Police Prepare for Air Raids Over New York

A new organization of the Police Department will be tried out soon in New York under the direction of Borough Police Inspector William O'Brien, so that New York City may be prepared for air raids.

Besides members of the Police Department, the organization comprises physicians, surgeons, nurses and helpers designated by the Health Commissioner. Each police station is headquarters for the precinct unit, and there are to be stored stretchers and all necessary medical and surgical supplies. Temporary dressing rooms are to be fixed up in each station, from which the wounded are to be sent to a designated hospital.

When an air raid comes, according to the plans already worked out, certain manufacturing plants will blow a designated signal, as an alarm to the relief workers. These workers will be card-indexed and will be called by telephone from the station if they do not respond promptly to the siren alarm. All ambulances and the owners of motors and trucks available for the volunteer work will also be listed for hurry calls.

This temporary organization is the result of a suggestion made to Police Commissioner Enright by Captain A. Wells Ingram, a British officer attached as lecturer to the American Red Cross at present. Captain Ingram has been in thirty air raids in London, Paris and Belgrade.

"We believe it quite possible for aeroplanes to be launched from the deck of submarines," said Mr. Woodhouse, member of the Board of Governors of the Aero Club of America. "U-boats have been employed for this purpose right along in European waters. The only hindrance in bombing New York, for example, would be the distance to be travelled by the U-boats. If the German submarines can reach here—and they have demonstrated they can—they can launch their hydroplanes at us.

"And Germany, I believe, will try it. She will do it, in the first place, with the idea of throwing terror into this country. Then she is so clever she can see the utility of such a raid in making sensational news screamers to be handed out to cheer up the German people and spur them on in the war."

Air Sections Move Quarters

Last week a number of the sections of the Air Division of the Signal Corps, Washington, D. C., was moved from their former locations in different parts of the city to the Arcade Building, 14th Street and Park Road, and it is understood to be the intention, as far as possible, to consolidate all the sections and divisions of the Air Division in this building.

© Western Newspaper Union.

Aviators who bombarded New York City with thrift literature, and Mrs. Burke Cockran and Mrs. Wm. R. Hearst, who were prominent in arranging the demonstration.

American Aviators in Italy Fly 212 Miles in 158 Minutes

Two American aviators accomplished on March 15th a fast flight from Foggia to Rome, flying the 212 miles in 158 minutes.

The aviators were Major Ryan, commander of the American Flying Corps at Foggia, who acted as pilot, and Captain Frost, who made the trip as observer.

Royal Flying Corps' Recruiting Bureau Has New Head

Lieut. Theodore Marburg, Jr., a native of Baltimore, and son of Theodore Marburg, ex-United States Minister to Belgium, has succeeded Major Lord Robert Innes-Ker, in charge of the recruiting depot of Royal Flying Corps, at 220 West 42nd Street, New York City. Lieut. Marburg was at Oxford when war was declared. He joined the Oxford University Officers' Training Camp in October, 1914, and was commissioned in the Royal Flying Corps in the spring of 1915.

After establishing a good record as a fighting airman, Lieut. Marburg lost a leg in an accident in December, 1915. After six months' leave, he qualified as a pilot a second time, and, notwithstanding the loss of his leg, is still an expert airman.

At the American Aviation Training Camps

Lieut.-Col. Hensley is to organize and command the new training school for balloon observers soon to be established on the "Lucky" Baldwin ranch, near Los Angeles, Cal. Last year he was placed in charge of the Fifth Balloon Squadron, at Fort Omaha.

First Lieut. Walter J. Johnson for whom there is a star in the service flag displayed by the banking house of J. P. Morgan & Co., was killed last week by falling 1,500 feet in an aeroplane at Kelly Field, near San Antonio, Texas. His parents, Mr. and Mrs. Michael H. Johnson, of No. 99 Highland avenue, Jersey City, received an official telegram from the War Department announcing the young man's death.

Lieut. George B. Post, Jr., was named as the Commander of the 83rd Aerial Squadron, displacing Lieut. Harry M. Winner, who was made Commander of the 203rd Aerial Squadron, now being organized at Chanute Field.

Augustus Post Lectures

On March 20th, Mr. August Post, Honorary Secretary of the Aerial League of America, addressed the Institute of Arts and Sciences, at Havermeyer Hall, Columbia University. The hall was filled to capacity. The subject of his address was "With the Sky Fighters."

Mr. Post delivered an address at the Anderson Galleries on the "Devastated Districts of France," on March 21st and 22nd.

The Fort Schuyler Club of Utica, New York, on March 23rd had the privilege of having Mr. Post as the chief speaker of the evening of March 23rd.

Lieut. Flachaire Flies in Washington

Lieut. G. Flachaire, one of the French "aces," ordered to this country to assist in the work of training American fliers, gave Washington a daring exhibition of the various acrobatic maneuvres now deemed necessary for successful solo work. He flew a Spad machine, the equipment furnished French aces for their air contests with the German champion aviators.

Speaking of accidents during training, he said to a newspaper correspondent that: "The losses in the schools are useless losses. They can be reduced by strict discipline, by the use of good instructors and by forbidding acrobatic flights until the pilot has absolutely mastered his art."

Wilkinson Will Test Liberty Motors

John Wilkinson, vice-president and consulting engineer of the Franklin Motor Company, has been named as the third member of the committee which is to test the Liberty motor. The other members are H. M. Crane, chief engineer of the Wright-Martin Aircraft Corporation, and designer of the Crane-Simplex motor, and D. McCall White, the designer of the famous Cadillack "8."

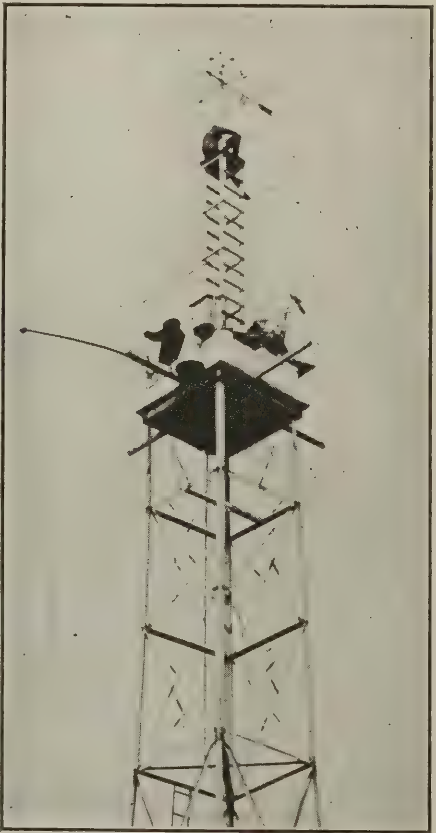
U. S. to Take Over Timber Land

The Senate discussed briefly the bill proposed by the Administration for commandeering forests and lumber supplies of the United States which was favorably reported several weeks ago by the Senate Committee on Military Affairs and later withdrawn for revision. Chairman Chamberlain of that committee, back on duty after his recent illness, volunteered an explanation of the necessity for the Government assuming control of the whole problem of timber supply by saying there had been great difficulty encountered by reason of I. W. W. activities in the Western lumber country.

State Senator Morris S. Halliday, of Ithaca, N. Y., is resigning his position to enter the Air Service.

"I do not know," said Senator Chamberlain, "whether they have been guilty of any overt acts either in destruction of lives or property, but conditions grew so desperate in Oregon and parts of Washington that men were afraid to go into timber to work. It became necessary to send military men out there, and it did not become possible to insure the production of lumber as demanded by the Government until men from Camp Meade, with rifles on their shoulders, were at hand to see that the work was carried on and that interference by the disorganizers was prohibited."

Athletic Equipment for Aviators



Observation tower at Naval Aviation Station, Warrington Beach, Pensacola, Fla., from which flying instructors observe work of student aviators. (Committee on Public Information.)

Men of the aviation service, by reason of their nerve-wracking work, must have complete relaxation when not on duty, and this relaxation is best attained through athletic contests of all sorts. In order to raise sufficient money to furnish each unit going abroad with athletic equipment, the National Aeronautic Committee, of which Mrs. Charles A. Van Rensselaer is chairman, is arranging a concert-dinner-dance, to be given in the Crystal Room of the Plaza sometime in April.

"We have equipped within the past few weeks," said Mrs. Van Rensselaer, "forty-six squadrons, but now our aid has been asked by the officers commanding the outgoing aviators to increase this supply vastly. We should be able to provide eighty outfits a month, but as each outfit costs $250 we are making an appeal to other patriotic citizens to join us in raising the large sum necessary."

Wardrop Addresses "The Round Table" and Other Organizations

G. Douglas Wardrop, the editor of "Aerial Age Weekly," addressed the "Round Table" at Columbia University on the subject of aerial warfare.

During the past week he has also addressed the combined Engineering Societies of Yale, the Quaint Club of New York, the Draco Club of New York and the Engineering Society of Providence, Rhode Island.

Evan J. David Addresses Cleveland Engineers

Evan J. David, business manager of "Flying," addressed the members of the Cleveland Engineering Society on "Aircraft in Warfare." The audience was thoroughly representative of all the engineering interests in Cleveland, and very keen interest was shown in Mr. David's lucid presentation of the subject.

The Resistal Goggle Controversy

Subsequent to the appearance of a despatch in a New York newspaper purported to come from the Rockwell Field at San Diego, Strauss & Buegeleisen, the manufacturers of Resistal goggles, have issued the following statement:

"The newspaper account in some papers made an alarming statement that a German conspiracy or plot had resulted in the manufacture and supply of defective goggles for use by aviators. The accounts related that bad landings and many accidents in landings had been caused by these defective goggles. In some newspapers, the name was given of the goggle and in others it was omitted, but, of course, the goggle referred to in each case was the Resistal goggle.

"It is most important that first of all it be thoroughly established that Strauss & Buegeleisen are not Germans, nor have they any Germans in their employ, the entire concern being American and all of its employees being American. It will be noted that Strauss & Buegeleisen are a young cooncern, composed of young men throughout and that they have absolutely no connection at all with anything that is German.

"The reports appearing in the paper were without foundation as they have been denied by Major Bartholf, commander of Rockwell Field at San Diego and by him also for Major John Purroy Mitchel, in the following telegram received from Major Bartholf by Strauss & Buegeleisen on March 25th:

> "The report that I have ordered the destruction of Resistal is entirely erroneous. Major Mitchell states that he has made no discovery or statement concerning Resistal, and that any such reports are without foundation. No official statement was given to any paper in regard to this matter."

"It appears, however, that the occasion for sending out this report was the receipt by the various camp commanders of a report issued by the Signal Office in Washington. This report recites entirely the findings of A. L. Day of the Carnegie Institute.

"Day's arguments were submitted to the Signal Corps in November 1917, but were not embodied in this official letter until March 12th.

"In the meanwhile, Strauss & Buegeleisen managed to induce the National Advisory Committee on Aeronautics, the Signal Corps and the Bureau of Standards to investigate the subject of aviator goggles and protective glasses, which investigation was begun by the Bureau of Standards Laboratory on March 1st.

"Their report, dated March 25th, recording Bureau of Standards test No. 23,004, is concluded with the following paragraph:

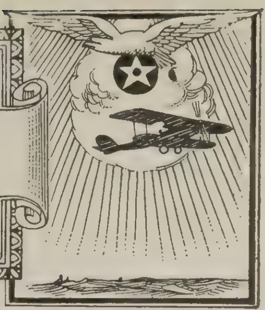
" 'The relatively increased nonshatterability of laminated glass and its comparatively good transparency and rigidity, even after fracture should be of great importance in devices for protecting the eyes and face.'

"It will be noted that this finding is directly contrary and contradicts flatly the findings of Mr. Day.

"Beside the non-shatterability of the glass, Day argues against the mechanical construction

(*Continued on page* 169)

NAVAL and MILITARY AERONAUTICS



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp. Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca. N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field. Arcadia, Fla.
DIK—Report to Camp Dick, Dallas. Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington. Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to Camp MacArthur, Waco, Tex.
Note 2—Report to Chandler Field, Essington, Pa.
Note 3—Report to Engine and Plane Repair Depot No. 2 Speedway, Ind.
Note 4—Report to Camp Hancock, Augusta, Ga.
Note 5—Report to Army Balloon School, Camp John Wise, San Antonio, Tex.
Note 6—Report to Hoboken, N. J.
Note 7—Report to Chicago, Ill., for duty with Board of Officers.
Note 8—Report to priorities committee, Council of National Defense.
Note 9—Report to Dayton, Ohio.
Note 10—Report to Aviation Repair Depot No. 1, Dallas, Tex.
Note 11—Proceed to Austin, Tex.
Note 12—Report to district manager of equipment, Curtiss Aeroplane & Motor Co., Buffalo, N. Y.
Note 13—Report to Minneapolis, Minn.
Note 14—Report to department aeronautical officer, Eastern Department, New York City.
Note 15—Proceed to Los Angeles, Cal.
Note 16—Report to Capt. James J. Newman, Dayton, O.
Note 17—Report to Lieut Col. William N Hensley, Arcadia, Baldwin race tracks, Los Angeles, Cal.
Note 18—Report to Post Field, Dallas, Texas
Note 19—Report to Aviation Field, West Point, Miss.
Note 20—Report to School for Radio Mechanics, Texas Agricultural and Mechanical College, College Station, Tex.
Note 21—Declined appointment, preferring previous commission.
Note 22—Proceed to Washington, D. C., and then to Wichita Falls, Tex.
Note 23—Proceed to San Francisco, Cal., for duty with Board of Officers.
Note 24—Report to Fort Monroe, Va.
Note 25—Report to Repair Depot, Indianapolis, Ind.
Note 26—Report to commanding general, Western Dept., San Francisco, Cal.

Special Orders 59 to 64, Inclusive

Arthur, Dogan H	FRF
Alvey, Paul	FRF
Aimee, Joseph M	SLR; FRF
Austin, Fred	FRF
Anderson, Samuel Herbert	SLR; CSO
Aaron, Robert Lester	SLR; KST
Annan, Duncan C	SLR
Allen, Morton Pickard	SLR; KST
Atwater, Benjamin Leonard	FLR; AGC
Aloe, Myron	SLR
Anders, Clarence E	SLR
Albro, Ames S	SLR
Altman, Harry L	SLR
Aaron, Robert L	DIK
Avent, Ira M	DIK
Adams, James D	DIK
Andre, Harold A	SLR; FRF
Anders, Clarence E	FRF
Annan, Duncan Colin	SLR
Altman, Harry Lloyd	SLR; PMT
Albro, Ames Schriber	SLR; RWT
Allen, Edmund T	FRF
Allen, Harris Campbell	REL; PFO

B

Benner, Wesley	FRF
Barnes, Ray A	FRF
Bijur, Harry	FRF
Bowen, Scott H	FRF
Berry, Richard B	FRF
Brooks, Arthur Raymond	FRF
Bealmer, William C	FRF
Burwell, Harvey B. S	TFT
Baxter, Hubert E	LHV
Brehm, Harry L	LHV
Beehler, Charles H	FRF
Bull, W. Frank	KST
Baxter, George R	FRF
Bell, Frederick D	PMT
Buckley, John Harold	FRF
Bond, George A	FRF
Benson, Robert H	FRF
Barr, Eugene O	FRF
Bardwell, Darwin E	FRF
Mandy, Russell M., Jr	FRF
Bond, George C	FRF
Brown, Roy S	REV
Baker, Richard Wheeler	SLR; CWT
Bent, George M	CSO
Benedict, George W	SLR
Black, John E	SLR
Blair, Parker	SLR
Boulton, Howard	SLR
Bower, Rolland F	SLR
Bryant, Marquis V	SLR
Burks, Charles N	SLR
Belding, Hiram Hurlburt	SLR; KST
Bradford, George Lewis	SLR; GLC
Burke, Thomas Ryan	SLR; AGC
Bigelow, James Leo	SLR; KST
Brown, George Leslie	SLR; CAF
Burkholder, Albert Napier	SLR; GLC
Burditt, Rollin Ashur	FLR; AGC
Baker, Warren L	FRF
Bentley, Frank Hugh	SLR; KST
Banks, Frank	SLR
Beamer, Gail H	SLR
Braun, Bruce E	SLR
Billett, Clifford H	FRF
Butler, William Henry, Jr	SLR; AOV
Bourgoine, Joseph John	AMV
Bailey, Elmer Samuel	SLR; EOT
Briggs, Elmer Joy	FLR; LDT
Balsley, Horace Clyde	CPR; GLC

Brooks, Lawrence L	KST
Belding, Hiram H	PFO
Boyle, Robert D	PFO
Blair, Paul Robert	GIT
Beardsley, Charles B	FRF
Bigelow, James L	DIK
Braukman, Clarence A	DIK
Bailey, John W., Jr	SLR
Barrett, Philip A	SLR
Beardsley, Charles B., Jr	SLR
Bedell, Edward	SLR
Burkett, Howard	SLR
Bonsal, Stephen, Jr	SLR
Brew, Paul	SLR
Brooks, Arthur R	SLR
Brown, Isaac G	SLR
Browning, Russell I	SLR
Buchanan, James P	SLR
Barker, Nelson E	SLR
Birmingham, William J	SLR
Boisseau, Marvin	SLR
Bouvier, John V. III	SLR
Bradbury, Frank M	SLR
Brant, Thomas.. J	SLR
Buell, Albert A	SLR
Beach, Merritt Stephen	DIK
Bloom, Edward Leon	DIK
Barrett, Philip A	DIK
Beehler, Charles Henry	DIK
Bentley, Frank H	DIK
Brooks, John P	FRF
Bentley, Madison	REV; Note 15
Beers, George Maclean	FLR; Note 19
Bradbury, Frank Muller	SLR; CWT
Beamer, Gail Hamilton	SLR; TFT
Burr, Richard O	PFO
Black, John Earl	SLR; EOT
Buell, Albert Appollos	SLR; GLC
Bouvier, John V	SLR; SBI
Boisseau, Marvin Edward	SLR; WFO
Bryant, Marquis Vernon	SLR; EOT
Braun, Bruce Emerson	SLR; EOT
Burks, Charles Nagle	SLR; CAF
Boulton, Howard	SLR; AGC
Blankler, Frank Joseph	SLR; GLC
Birmingham, William James	SLR; PMT
Bauscher, John G	PFO
Benedict, George W	SLR; CAF
Bower, Rolland Follmer	SLR; CRI
Banks, Frank	SLR; EOT
Blair, Parker	SLR; WFO

T. Guy Gilpatrick, with the American Air Forces in France.

C

Clark, Clifton W	CWT
Clark, Kenneth L	FRF
Clark, Harold L	FRF
Campfield, Hugh C	FRF
Crawford, Daniel McL	FRF
Cleveland, Robert L	FRF
Cunliffe, William H., Jr	FRF
Coon, Sylvanus C	CPR
Coletti, Vincent J	FRF
Clowes, Lloyd R	FRF
Curtis, Tobin S	RSD; FRF
Carhart, Harold Whitfield	SLR; GLC
Carnahan, Lawrence B	SLR
Clendinning, William R	SLR
Cobb, Ernest W	SLR
Conover, George S	SLR
Crawford, Leland D	SLR
Cunningham, William Newton	SLR; LHV
Cooper, Frederick Allen	SLR; LHV
Corey, Joseph Geer	SLR; CAF
Crosthwaite, Robert Orville	SLR; EOT
Curry, James Thomas, Jr	SLR; KST
Carr, John Preston	SLR; LHV
Childs, John Shedd	SLR; LHV
Clark, Ralph I	DIK
Cheney, Christopher Arthur	FLR; CSO
Culbertson, Robert Alexander	SLR; LHV
Clarkson, John Wheeler	SLR; LHV
Coad, Ralph George	SLR; LHV
Cathcart, Sewall Chandler	SLR; EOT
Curtiss, Frederick Willard	SLR; EOT
Colville, Clifford James	SLR; RWT
Claghorn, James Lawrence	SLR; EOT
Crane, Oliver P. H	SLR
Cupp, Robert Otis	FRF; SLR; GLC
Compere, Harold	DIK
Conner, Harry G	KST
Coon, Sylvanus Charles	CPR; CWT
Carey, Edwin Forrest	BST
Clark, John B	FRF
Curry, James T., Jr	DIK
Crandall, Winfield R	KST
Conant, David J	SLR
Cady, Curtis L	SLR
Chapman, Leonard B	SLR
Churchill, Henry S	SLR
Clifford, Paul L	SLR
Comly, John	SLR
Coward, Raymond S	SLR
Cassell, Andrew T	FLR
Cahill, Harry J	SLR
Close, William E	SLR
Cooper, Ransom, Jr	SLR
Coward, Raymond	PFO
Chase, Oscar F	KST
Cupp, Robert Otis	DIK
Chambers, Lilburn B	Note 1
Cantwell, James W	FRF
Carnahan, Lawrence Barrett	SLR; HHN
Close, William Edward	SLR; RWT
Cassell, Andrew Toy	SLR; CSO
Clendinning, William Rudell	SLR; EOT
Cobb, Ernest Williams	SLR; CRI
Cran, Oliver Perry Hazard	SLR; EOT
Cahill, Harry Joseph	SLR; ELA
Conover, George Stribling	SLR; ELA
Cooper, Ransom, Jr	SLR; WFO
Crawford, Leland Donaldson	SLR; SMM
Coles, Paul D	PFO
Crebs, Harry D	REV; Note 21

D

Derge, David R	FRF
Dale, Russell R	FRF
Davidson, Frank C	FRF
De Castro, Ralph E	FRF
Decker, Kenneth	FRF
De Shields, Charles B	FRF
Dudley, John Earl	SLR; EOT
Doutt, Robert Henry	SLR; CSO
Dight, Frederick Byron	SLR; CAF
Deeves, Edwin Pratt	SLR; CWT
Delana, Edward K	SLR
Dichman, Ernest W	SLR
Davis, Louis Eddy	SLR; EOT
Dunn, Valentine Francis	SLR; WFO
Dwan, James Florence	FLR; AGC
De Smet, George W., Jr	SLR
Durar, George H	SLR
Dusseau, Rudolph W	SLR
De Van, Howard G	SLR
Dillon, Milton S	SLR
Dunbar, James A	SLR
Dworschak, Joseph F	SLR
Dudley, Albertus T.	REL Note 7
Damm, Henry J	Note 9
Dimmig, Howard	FRF
D'Arcy, James	FRF
Disque, Robert C	CSO
Dichman, Ernest Wykeham	SLR; TFT
Delana, Edward Keenan	SLR; EOT
Duane, Richard B	REL; Note 8
Dillon, Milton Sands	SLR; CLC
Dworschak, Joseph Fred	SLR; CLC

E

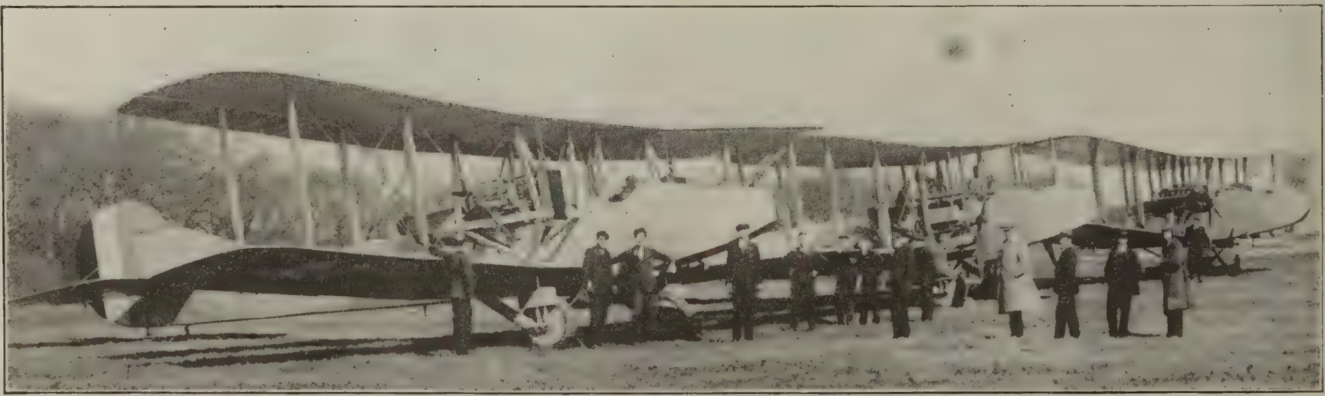
Ellis, Samuel L	FRF
Eddy, Paul L	FRF
Ellwood, Philip H	LHV
Emmerich, Edmund M	SLR; AAD
Elliott, Edward	FRF
Easley, Sam Allen, Jr	SLR; EOT
Ebner, Gerald Loring	SLR; RSD
Elwell, Charles Clement, Jr	SLR; WFO
Earle, Marion Marmaduke	SLR; EOT
Elliott, Douglas S	FLR; PFO
Eldred, Warren B	DIK
Evans, Earl F	FRF
Evans, Brinkley	SLR; AOV
Edgerton, James C	SLR
Edmiston, Hugh C., Jr	SLR
Edens, Roderick H	SLR
Eewell, Russell Tuttle	SLR; WFO
Elliot, James H	SLR
Emmons, Bernard Wentworth	SLR; GLC
Estabrook, Frederick R	SLR
Emory, George North	SLR; EOT
Estill, Frank S	FRF
Estabrook, Frederick Reed	SLR; RWT
Edens, Rodrick Murchison	SLR; GLC
Edmiston, Hugh Caldwell	SLR; Note 25

F

Fanning, Winthrop C	FRF
Fisher, Frank W	FRF
Foss, George A	FRF
Ferguson, Otto	FRF
Florian, Charles H	LHV
Foddy, Howard K	FRF
Frazee, Harold D	DIK
Fowler, Lee Thomas	SLR; BST
Frierson, Samuel G	FRF
Farris, William B., Jr	SLR
Feast, Harry C. L	SLR
Forbes, Howell	SLR
Frost, Ezra R., Jr	SLR
Foust, William E	KST
Fletcher, William Russell	SLR; CRI
Ferguson, William Ward	SLR; AAD
Farr, Newton Camp	SLR; CMV
Fraser, Kenneth G	DIK
Forbes, Wylie H	SLR
Fillmore, William H	DIK
French, Jasper J	DIK
Fallon, Francis Isidore	SLR; WFO
Fagg, Fred Dow, Jr	DIK
Fahrney, Ira S. P	Note 4
Fidler, Charles F	FRF
Ferguson, James H	Note 24
Fitzgerald, George Francis	Note 18
Fay, Arthur E	REV; Note 21
Fenderson, George E	SLR; SMM
Fonda, George A	SLR; HHN

G

Garoni, Rudolph	FRF
Green, Alfred M	FRF
Gillett, John D	FRF
Grassi, Waldemar Howard	SLR; TMA
Goodwin, Thomas Gregory	SLR; LDT
Gober, James Lafayette	SLR; KST
Garver, Chauncey Brewster	SLR; PFO
Geisse, John Harlin	SLR; EOT
Galbreath, Thomas M	SLR



Three of the twin-motored Avro bombers ready for flight. Photo passed by British Censor. Courtesy A. V. Roe Co.

Gibson, Peyton....SLR
Giroux, Victor L....SLR
Gober, James L....DIK
Gibson, Mortimer....SLR
Glynn, Martin E....SLR
Godfrey, Frank H....SLR
Gilmore, Donald Henry....DIK
Goldsborough, George Joseph....SLR; GLC
Glankler, Frank J....SLR
Groom, Wilbur F....SLR
Graicunas, V. A....SLR
Gonosbe, George Jonathan....DIK
Gilman, Arthur Reynolds....SLR; EOT
Graham, Joseph Andrew....FRF
Gantz, Harry....FRF
Grace, Morgan H....REV; CSO
Goetz, Norman S....Note 18
Gouse, Frederick M....Note 6
Garrett, William G....Note 6
Gape, Leo B....CWT; Note 22
Graham, Harry....KST
Graicunas, Vytautas Andrew....SLR; EOT
Groom, Wilbur Frank....SLR; SBI

H

Hill, Edward A....FRF
Heyden, Arthur L....FRF
Howard, James D....FRF
Hennessy, Harold Patrick....SBI
Hinsch, Charles L....SLR
Harris, Alexander H....GLC
Mamilton, Stewart A....FRF
Hamilton, Mark A....FRF
Horner, Harold R....FRF
Hughes, John James....SLR; FOB
Hall, John W....GLC; WCS
Hughes, James W....WFO
Hartshorne, Frank W. K....SLR; FRF
House, William Russel....DIK
Holland, Maurice....FRF
Hirst, Barton Cook, Jr....SLR; TFT
Hellenberger, Frederick W....LDT
Hebberd, James L....DIK
Hinsch, Charles Louis....SLR; VBW
Hill, Thomas Leo....FRF
Hall, William Chapman....DIS
Hoppin, Bayard C....OSU
Harrington, George Perkins....SLR; CRI
Heer, Clarence....SLR; CRI
Hayden, Thomas H., Jr....DIK
Hawes, Herbert R....SLR
Holmes, Wayne M....SLR
Harrison, William W....SLR
Hartline, William R....SLR
Hill, Thomas L....SLR
Hutterly, Andrew J....SLR
Henry, William L....SLR
Hodgson, Harold G....DIK
Hiestand, Benjamin....DIK
Horrell, Camden Riley....DIK
Hazen, Raymond Crandall....SLR; WFO
Hunt, William Dudley....SLR; TMA
Hall, William Ernest....SLR; GLC
Harbeck, Edward Vincent....SLR; KST
Hall, John C....SLR; DIK
Hunn, William F....SLR; DIK
Hill, Armisted B....PFO
Hoffhaus, Henry B....Note 20
Holland, Albert H....REV; Note 21
Hersey, George F....Note 24
Horstkotte, Edward H....Note 11
Hensley, William N., Jr....WCS; Note 15
Hall, Elbert J....WCS; Note 9
Hightower, Alfred J....SPD
Host, Thomas P....PFO
Hedlund, Theodore E....FRF
Heafer, Harold W....FRF
Hardie, Lloyd Mervyn....SLR; ELA
Hinkley, Ray Alfred....SLR; SMM
Henry, William Lawson....SLR; EOT
Hillabold, Arthur B....Note 24
Hurst, Ernest Le Roy....SLR; BST
Harwood, Wallace B....FRF
Heard, Jack W....KST

I

Ison, Nathaniel Burt....SLR; EOT
Illich, Jerry T....FRF

J

Johnson, Joseph K....PFO
Johnston, James A....Note 2
Johnston, George E....FRF
Johnstone, Clifford....FRF
Jordan, William J....DAF
Jones, Parke P....FRF
Jones, Fred Lemuel....DIK
Jenkins, James W....REV
Judge, Joseph Bermingham....DIK
Jones, Brevard M....FRF
Jackson, Joseph W....PFO
Jefferson, Theodore P....PFO
Jeffries, John M....SLR
Jones, Edward D....SLR; EOT
Jones, Charles Clothier....REL; Note 31
Jones, Kirtley....FRF
Jenkins, Burris Atkins, Jr....SLR; EOT
Jordan, Richard C....REV; CSO

K

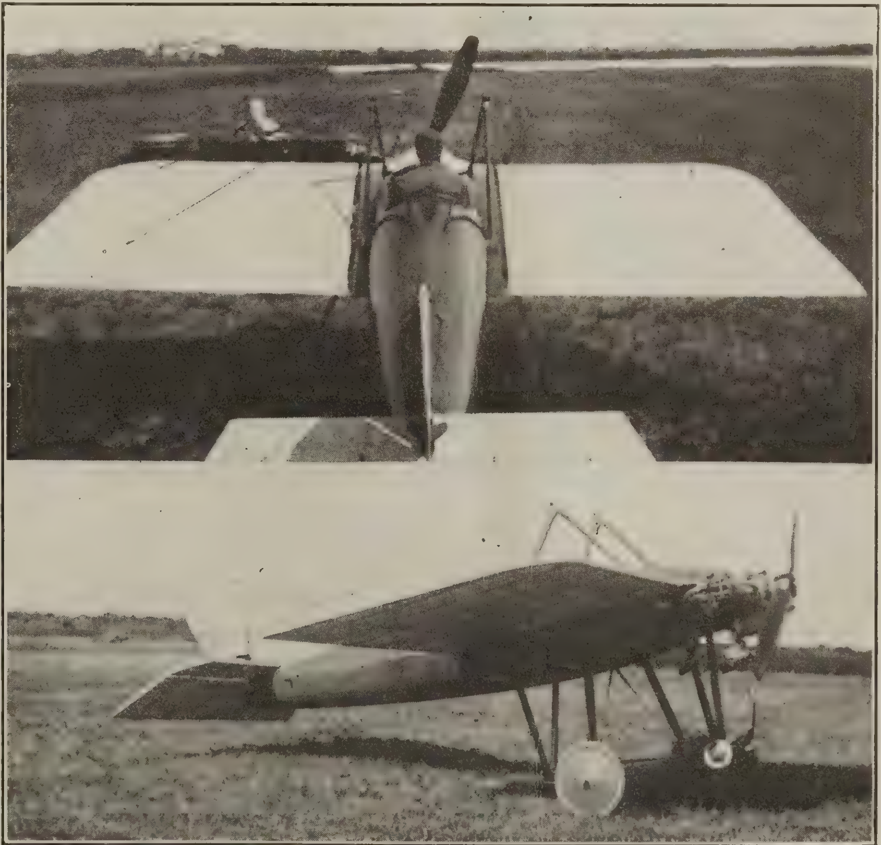
Kenyon, Johnson D....FRF
Kindred, Herbert L....FRF
Koepfgen, Leslie Philip....FRF
Kinsley, Wilburt Edward....FRF
Keeler, Philip B....KST
Kingsman, Spencer S....GLC
Klein, Arthur H....SLR
Kendall, John D....FRF
Kirkby, Kent S....FRF
Klein, Arthur Hays....SLR; CWT
Koontz, Ralph G....FRF
Koch, Alfred Schnider....SLR; AAD
Kennedy, Clement E....SLR
King, William C....SLR
Kinsmon, Harry B....SLR
Keeffe, Louis R....SLR
Kelly, Philip J....SLR
Kent, George S....SLR
Kennedy, Donald Brundage....SLR; GLC
Kennedy, David S....PFO
Keller, Frederick William....DIK
Knight, James Herbert....SLR; EOT
Kircher, Albert Eugene....SLR; Note 16

L

Lamborn, Charles W....RSD; FRF
Lodge, Wellington M....FRF
Lee, John F., Jr....FRF
Lane, Leroy C....FRF
Lockhead, Archie....SLR; FRF
Linson, Harry W....SLR; FRF
Lee, Colin K....MSC
Lee, George Terry....SLR; WFO
Little, Robins....SLR; WFO
Livingston, Austin Edward....SLR; WFO
Lemmon, Brice Walter....SLR; CRI
Lipscomb, MacDonald E....SLR; DIK
Loud, Harold E....PFO
Lees, Herbert G....DIK
Landon, Charles Howard....SLR; CWT
Lorch, Louis, Jr....REV; Note 21
Latimer, Earl H....Note 24
Liebhauser, Edgar Andrew....SLR; EOT
Lobdell, Warren Lamson....SLR; DIK
Lindsey, Harold....SLR; GLC
Lynch, Andrew M....Note 17
Lawrence, Dudley B....Note 7
Lord, Albert C....Note 3
Loebl, Andrew W....REV; Note 21
Leonard, Albert Victor....SLR; RWT

M

McEachran, W. H....FRF
McNulty, Dwight L....FRF
McCurdy, John A....FRF
McClean, Hubert D....FRF
McCaffrey, James R....FRF
McDowell, Robert N....FRF
Myers, Devereux M....FRF
Myers, Maurice C....FLR
Myers, Paul K....GLC
Murphy, Robert E. Lee....FRF
Mathews, Joseph J....LHV
Molter, Bennet A....FRF
Magill, William L....FRF
Millard, Jesse C....FRF
Malone, Gilbert....FRF
Males, Daniel....SLR
Myers, William Blount....FRF
Martin, William George....BST
Myers, Maurice C....SLR; PFO
Manookin, Kerrigan M....SLR
Moore, James II....SLR
Morrison, William R....SLR
Murphy, Francis E....FRF
Moran, John Ralph....SLR; KST
Males, Daniel....SLR; CSO
Magowan, David Walter....SLR; TMA
Morison, James C....FRF
McCracken, Nelson....ELA
McLafferty, Joel E....CSO
McHenry, Arthur James....DIK
McDonald, Benjamin F....SLR
McIntyre, Clifford Samuel....SLR; GLC
Murray, Charles William....SLR; DIK
Merrick, John F....LHV
Merrick, Louis Meline....SLR; RWT
Magee, David Willis....DIK
McMilnn, Wiley W....DIK
Martin, Charles N....KST
Morill, Albert Henry....REV
Morrill, Carlton H....SLR
Messner, Arthur W....SLR
Morris, George William....SLR; GLC
Morris, William Colb....DIK
Mader, Luther P....SLR
McCarn, Clarence C....KST
McLaughlin, Henry Patrick....SLR; CRI
McCormick, Cyrus, Jr....SLR; CRI
Minges, Henry V....DIK
Moran, John R....DIK
Martin, Robert....DIK
Meller, Lloyd....DIK
Maloney, John A....FRF
Millard, Marland B....FRF
Mercer, W. E....KST
Mandel, Oscar....SLR
Marshall, Wilson, Jr....SLR
Martin, Robert....SLR
Meyer, Lester L....SLR
Moore, Edwin C....SLR
Morrissey, Raymond A....SLR
Miller, Clarence L....SLR
Moore, Robert S....SLR
Morse, Charles Lester....SLR; DIK
Morison, James Currie....DIK
Morgan, William Victor....DIK
McNamara, Sherman Edward....SLR; CSO
Moncrieff, Howard Francis....SLR; TMA
Moore, James....SLR; CSO
Montgomery, Harry E....Note 24
Murray, Charles William....SLR; AAD
MacFadden, Willford, Jr....SLR; EOT
Miller, Eralbert Talmadge....SLR; CAF
McNeil, Bert....Note 12
MacGowan, Kenneth A....FRF
Manookin, Kerrigan Mark....SLR; KST
Morrison, William Robert....SLR; SBI
Maurer, Alfred L....Note 3



The Breese Penguin, designed by S. S. Breese, equipped with a 2 cylinder 26 H.P. Charles Lawrence motor.

N

Norris, Howard D	FRF
Nourse, James Percival	SBI
Newkirk, George H	FRF
Noel, Sidney Q	FRF
Nietz, Adolph H	FRF
Nowlen, Stanley	PFO
Nason, Arthur L	SLR
Neely, Forest H	SLR
Nelson, William T	SLR
Nielsen, Gustaf A	SLR
Nielsen, Gustaf Arnold	SLR; ELA
Nisbet, Kenneth Rhea	SLR; WFO
Nugent, Charles Wright	SLR; GLC
Newcomb, Walter D., Jr	SLR; PFO
Neuburger, Lawrence Baerman	FRF

O

Owens, Leo E	SLR
Owen, Richard	FRF
Offutt, Magruder W	SLR; AAD; FRF
O'Neil, Paul F	FRF
Ordway, William Floyd	DIK
Owens, Leo Edward	SLR; RWT
Otto, Charles Dana	SLR; AOV
Osborn, Loyall A., Jr	SLR
Oley, Willard Simon	SLR; CWT
Ong, David G	Rev; Note 9; WCS

P

Payne, Owen S	FRF
Pratt, Weldon G	FRF
Prosser, Harvey W	FRF
Pell, Clarence C	FRF
Peck, Arthur H	GLC
Pyne, Herbert R	FRF
Price, Harlow R	FRF
Pavesich, Francis X	FRF
Parker, J. Brooks B	CSO
Potter, Norman W	FRF
Powell, John N	FRF
Peabody, Burton W	FRF
Peabody, Howard B	OSU
Pierce, Theron Ernest	SLR; TFT
Parsons, Harry O	WFO
Pogue, Davenport	SLR; GLC
Porter, Mark Leslie	KST
Peterson, Tenny C	SLR
Perry, William Leslie	DIK
Padgett, Frank A	KST
Presley, Curtis Edward	SLR; EOT
Powers, Harry W	SLR
Peterson, Vance C	SLR
Potter, Charles M	SLR
Prince, Harry W	SLR
Perry, William H	SLR
Percivall, Joseph Jerauld	SLR; HHN
Pendleton, Talbot Taylor	SLR; EOT
Powers, Harry Winn	SLR; AMV
Peterson, Tenny Carl	SLR; EOT
Prendergast, John Patrick	SLR; GLC
Phipps, Lawrence C	CSO
Pound, Murphey	FRF
Phillips, Michael James	CPR; CSO
Pond, Roger Virgil	SLR; ELA
Pollock, Fay Hall	SLR; RWT

R

Richardson, Durston G	FRF
Richardson, Edward H	FRF
Richardson, James M	FRF
Robinson, Geroid	OSU

Mr. S. B. Riley, Production Manager of A. V. Roe & Co., England, who recently made a tour of inspection of American aircraft factories.

Roberts, William R	FRF
Roberts, Frank L	FRF
Reitenbaugh, John S	FRF
Randall, Merwyn C	EOT
Russell, Robert H	GLC
Raleigh, Joseph	LDT
Russell, Leroy E	KST
Russell, Frank L scum	SLR; TFT
Reilly, George C	FRF
Ray, James G	FRF
Robison, Ralph T	SLR
Reiland, Albert F	SLR
Ross, Dunning Hart	SLR; GLC
Ramseur, Benjamin F	SLR
Reis, John B	SLR
Ritchie, William J	SLR
Richardson, Ernest L	DIK
Regester, Howard William	SLR; CWT
Royer, David A	FRF
Renfro, De Grimme	LHV
Roardon, Charles S	SLR
Reimann, Benjamin C	KST
Rowland, Wilfred Ernest	SLR; LDT
Reynaud, Henry	WCS; Note 16
Rorick, Estell H	SLR; GLC
Reardon, Charles Stanislaus	SLR; BST
Reiland, Albert Francis	SLR; CRI
Rice, Perley Augustus	SLR; LDT
Reel, Herbert William	SLR; WFO

The Engineering Aero Squadron training at the Massachusetts Institute of Technology. (Courtesy, Technology Monthly.)

Ray, Russell	SLR; CMV
Reiff, Marion C	REV; Note 21
Russell, Everett P	SLR; PFO

S

Sanborne, Paul F	FRF
Smith, Albert H	FRF
Smith, Warner G	CWT
Smith, Maynard L	FRF
Smith, Hugh Letcher	SLR; EOT
Smith, Leonce H	SLR; KST
Smith, Landis Shaw	SLR; AAD
Smith, William Conwell	SLR; CRI
Smith, Armand V. E	KST
Smith, Howard	FRF
Sutton, Sherwood	FRF
Sultan, Walter D	PFO
Stalker, Thomas A	FRF
Simon, Herbert J	FRF
Simonson, Floyd L	EOT
Short, Sidney Elbert	CUI
Scott, Grant E	FRF
Studler, Rene R	KST
Squier, Merrill A	FRF
Souders, Michael	SLR
Sloan, Kellogg	FRF
Sherman, Cecil Kent	Note 17
Shipley, James H	Note 21; REV
Shepher, John Eldon, Jr	Note 14
Sewell, Robert B	SLR
Shapiro, Robert	SLR
Smith, Paul J	SLR
Stanley, Walter S	SLR
Stauffacher, Earl M	SLR
Stephenson, Arthur R	SLR
Stevenson, Frederick F	SLR
Stevenson, Francis Lionel	SLR; EOT
Strong, George E	SLR
Swan, Charles H	SLR
Sheridan, William Rakow	SLR; CWT
Scott, William Hart	SLR; LHV
Sullivan, Del Lawrence	SLR; PFO
Sullivan, Daniel James, Jr	SLR; AAD
Sullivan, Jerry, Jr	SLR
Summers, John Hoagland	SLR; PFO
Sawyer, Gordon B	SLR
Scarborough, William B	SLR
Schemmel, Frank P	SLR
Sinnen, Frederick E	SLR
Stembridge, Alfred R	SLR
Strong, David H	SLR
Souza, William B	SLR; AAD
Skidmore, Andrew A	DIK
Souders, Michael	SLR; GLC
Seifert, Frank Walter	SLR; KST
Sibley, Henry H	FRF
Scharffin, Paul Philip	SLR; AGC
Sweinhart, Victor C	ELA
Sager, George Weir	CPR; CGS
Sharon, Robert A	SLR
Sherman, Hugh S	SLR
Sherwood, Carey	SLR
Schroeder, Wainwright	SLR; LHV
Schauweker, Arthur Albert	SLR; TMA
Secord, Lynn Newman	SLR; LDT
Severin, Shirley	CGS
Selligson, Lamar Garlick	SLR; BST
Stratemeyer, George E	KST
Stees, Donald B	DIK
Stoddard, David I	DIK
Sloan, Elmar Thomas	SLR; GLC
Selmser, Edward Godfrey	SLR; TFT
Slauson, Frederick Charles Thatcher	SLR; EOT
Schlatter, Donald Wayne	SLR; EOT
Southworth, Gilbert S	SLR
Steele, John L., Jr	SLR
Schanck, Rollin N	PFO
Sheffield, Frank H	PFO
Silcott, Arthur E	PFO
Stock, Hugo L	PFO
Seifert, Frank W	DIK
Silleck, Romer R	KST
Schreiber, John A	TMA
Sinnen, Frederick Emil	SLR; MSC
Smith, Charles H	REL; Note 26
Smith, Lowell H	FRF
Smith, Paul Judson	SLR; TFT
Smith, William C	FRF
Stevenson, William F	Note 6
Sharon, Robert Alexander	SLR; LDT
Sain, James E	FLR; Note 6
Southworth, Gilbert Stark	SLR; EOT
Schutta, Joseph J	DIS
Sherwood, Carey	SLR; Note 25
Sullivan, Jerry, Jr	SLR; BST
Steele, John Lyle, Jr	SLR; EOT
Strong, David Henry, Jr	SLR; BST
Schemmel, Frank Pfister	SLR; PMT
Sherman, Hugh Sutherland	SLR; PMT

T

Tompkins, Sterling	FRF
Tompkins, Frederick	FRF
Taylor, James R	CPR
Tansley, Thomas L	FRF
Taylor, Carroll G	FRF
Tailer, James B	REL; OSU
Teichman, Herbert Henry	FRF
Trotter, David K	FRF
Taylor, William P	FRF
Tansley, Thomas L	PFO
Thiel, William A	PFO
Tozzer, Alfred M	Note 23; REL
Thompson, George S	SLR
Townley, Francis R	SLR; DIK

(Continued on page 170)

EVERY MILITARY AVIATOR OUGHT TO KNOW WHAT HIS OWN AND THE ENEMY'S MACHINE CAN DO AND HOW THEY LOOK

By HENRY WOODHOUSE

Author of the "Text-book on Naval Aeronautics", "Text-book on Military Aeronautics", etc.

IN the last two issues the writer pointed out that the Allied Government found it necessary to teach their aviators and students all about their own machines, and as much as possible about the enemy's machines, particularly their appearance. As a basic principle, the aviator is taught that what does not look like one of the Allied machines must be an enemy machine. Therefore, every effort should be made to bring it down.

The anti-aircraft forces are taught the same thing, and that knowledge of the features of the different types of aeroplans is one of the prime factors in making the anti-aircraft forces efficient.

Lacking that knowledge, both the Allied air forces as well as the anti-aircraft defenses, get confused and permit the enemy to get temporary advantages, which cost the lives of Allied aviators, as well as of the population of the cities which are raided—without mentioning the strategic advantages which the enemy gains through gathering information or surprising the Allies.

Besides teaching military aviators to know their own and the enemy's machines, what they can do and how they look, the Allied authorities also found it advisable to have continuous progressive changes in their types of aeroplanes.

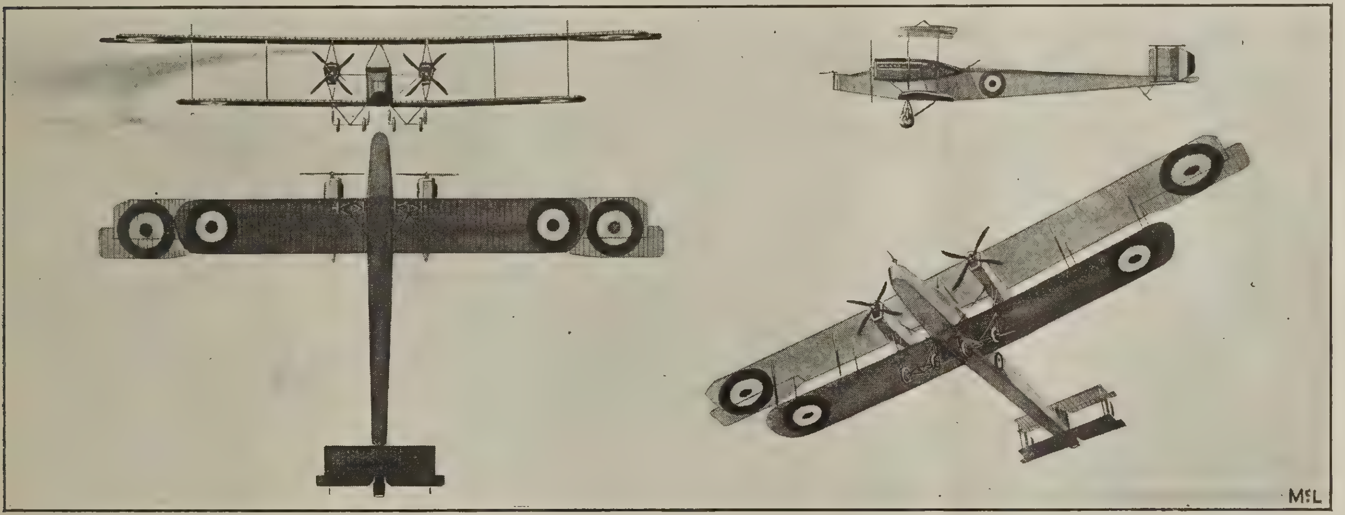
It was found that German aviators had a certain amount of fear for a new type of aeroplane, because they did not know what it could do and past experience had taught them to beware of appearance. As a member of the Lafayette Escadrille put it: "The Boche was never so surprised as when he attacked a certain type of machine which looked like a two-seater, and got fired on by the third passenger, who was an extra gunner, well equipped with twin Lewises."

The policy of keeping the enemy "guessing" is good strategy—so long as it does not interfere seriously with production. It can be applied especially in the smaller types of machines used to maintain the supremacy in the air during the daytime on the fronts. It has little value in so far as the large bombing machines used for night bombing are concerned, because the night aeroplanes cannot be seen. It may be deducted from the types of German machines captured that the Germans are also following this policy. They keep up a continuous progressive change of types, adopting the good points of captured Allied machines, adding other points which are suggested by the progress of the science.

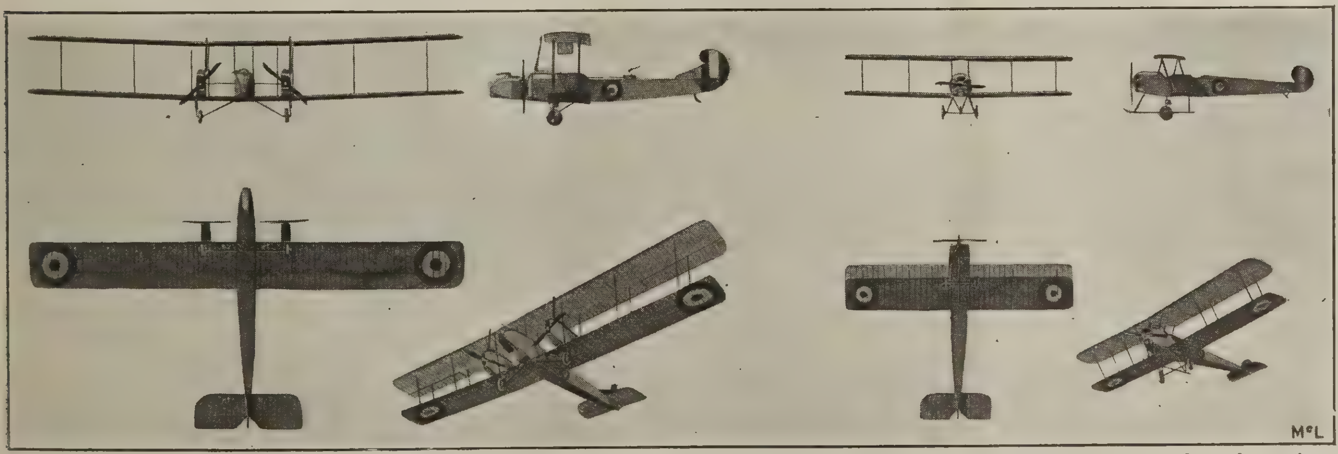
The Gothas followed the capture of the Handley-Page bomber, and now the dispatches advise that the Germans are building larger machines equipped with four motors.

Some of the smaller machines look very much like the French and British machines and it would be hard to recognize one from the other, were it not for the iron cross on the planes. This similarity in characteristics has necessitated closer study of German types and how they look.

Aeroplanes to follow in succeeding issues, in connection with the identifications of military aeroplanes: Pomilio, S. V. A. and others.



Handley Page (British) Twin-engine bombing biplane. One of the largest machines built. It is equipped with two 12 cylinder Rolls-Royce engines of 280 H.P. each. It holds all world's records for large aeroplanes carrying from one (1) to twenty-one (21) passengers. Its wing span is 98 feet. Three Lewis Guns are mounted, two forward and one at the rear. It is identified by its biplane tail, the motor nacelles mounted between the planes, the large overhang of the upper plane and the balanced ailerons. The undercarriage is composed of four shock-absorbing wheels and a small tail skid. The planes are not swept back (as in the German Gotha aeroplane). The Handley Page is a tractor with four-bladed propellers, while the Gotha is a pusher having two-bladed propellers. The engines on the Handley Page are situated entirely forward of the interplane struts, with a fuel compartment aft, but the Gotha's engines are situated between the planes, with portions of the trailing edges cut away for the movement of the propeller.



Avro (A. V. Roe & Co., Ltd.) (British.) The Avro machines have an equal upper and lower wing span. In the twin motored machine the engines are carried on the lower plane, with exhaust stacks running up over the upper plane. Sunbeam, Green or Rolls-Royce vertical engine are used. The landing gear is made up of steel tubing with a wheel located beneath each of the two engines. Two machine guns are mounted on revolving gun rings. The two-seater Avro has highly staggered wings and a slight dihedral. The landing gear is characteristic; the long central skid is located between the wheels, supporting V struts at either end. The rudder is of the balanced "comma" type. There is no vertical fin. A rotary 100 H.P. Gnome or a Le Rhone engine is used.

THE C. IV RUMPLER BIPLANE

THE Rumpler biplane described below belongs to the "C" class of enemy aeroplanes. That is to say, it is a general utility machine, and is perhaps the best in its class. It is chiefly of interest on account of its great speed, which is equal to that of a chaser single-seater, and also on account of its high "ceiling" (6.500 metres). This capacity for flying at great altitudes has led the German aviation services to employ a special respirator adopted recently. The climb of the Rumpler C. IV is also very good (5,000 metres in 35 minutes).

General Specifications

Span, upper plane	12.60	Metres
Span, lower plane	12.10	Metres
Chord, upper plane	1.70	Metres
Chord, lower plane	1.30	Metres
Area, upper plane	20	Sq. Metres
Area, lower plane	13.50	Sq. Metres
Gap between planes	1.85	Metres
Stagger	0.60	Metres
Overall length	8.40	Metres
Overall height	3.25	Metres
Engine, Mercédès	260	H. P.
or Maybach	250	H. P.
Climb in 35 minutes	5,000	Metres

Wings

Both upper and lower wings are swept back 3 degrees. There is a dihedral angle of 2 degrees and the wings are staggered forward 0.60 metres. The trailing edge, contrary to usual German practice, is rigid. The ribs, which are made of three-ply wood, pierced for lightness, are spaced 0.30 metres apart. Their angle of incidence is uniform and is equal to 5 degrees.

In plan the upper wings are of trapezoidal form, with rounded angles. Above the fuselage the trailing edge is cut out as shown in the illustrations. The maximum chord is 1.70 m. In each of the upper wings there are 19 main ribs, and five compression struts of steel tubes. The ailerons are of the tapering type, their chord varying from 0.50 to 0.65 m. The lower wings, as in so many other German machines, have rounded wing tips. As the radius of the arc forming the rear edge is longer than that of the front, the wing tip somewhat resemble that of a propeller blade. Each of the lower wings has 17 main ribs, and four steel tube compression struts.

The interplane struts, of which there are two pairs on each side of the fuselage, are oblique. In section, the inner front struts measure 0.105 m., and the rear strut 0.130 m., while the outer front strut measures 0.090 m. and the rear outer strut 0.085 m. The gap between the wings is 1.85 m., and the total lifting surface is 33.5 square metres, of which the upper wing is 20 square metres and the lower wing 13.5.

Tail

The tail plane, which is not adjustable, is not so deep as in previous types. In plan, the leading edge of the tail plane is approximately a semi-circle. This tail plane is supported on each side by struts attached at their other end to the bottom rail of the fuselage. Two other struts brace the tail plane to the vertical fin. The struts under the tail plane are provided with a series of sharp-edged metal points. It appears probable that the object of these is to prevent the landing crew, when wheeling the machine about, from catching hold of these struts, thus possibly bending them. The elevator is in two parts, each of which is partly balanced by a triangular forward projection. The rudder, which is built up of metal tubes, is of the usual type, and the control cables pass inside the fuselage, guided at points through small wooden tubes.

Fuselage

The construction of the fuselage is of the current type, with four longerons and struts and cross members, braced by piano wire. Front and rear are covered with three-ply wood, and the middle with fabric. The propeller (a Heine) has a diameter of 3.17 m. As on all other German machines, the propeller boss is enclosed in a "spinner."

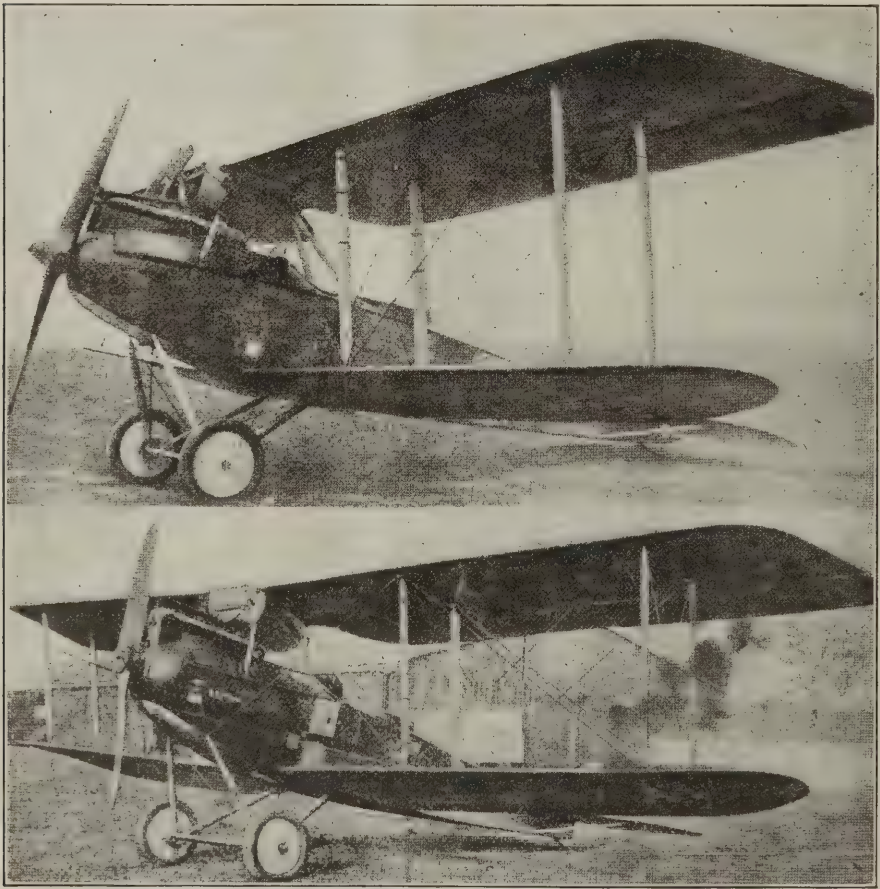
Engine

The motor fitted on the Rumpler is either a 260 h. p. Mercédès or a 250 h. p. Maybach, both having six vertical cylinders.

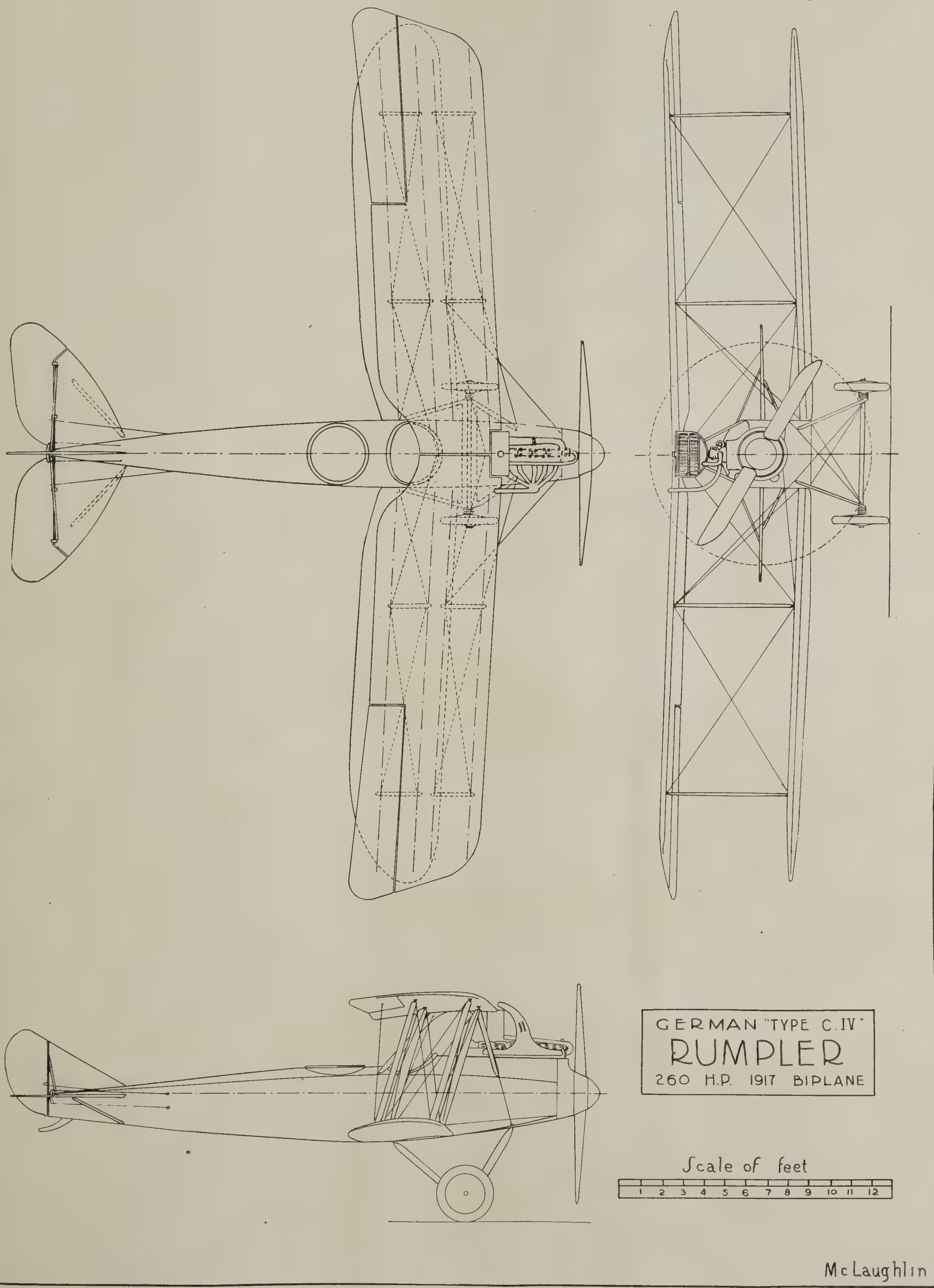
When the Mercédès is fitted, it is slightly tilted to the right, in order to allow the induction pipes to pass between the legs of the cabane. With the Maybach, which offers less encumbrance, this arrangement is not necessary. The motor is supplied with fuel from two tanks. The main one (about 220 litres) is placed under the seat of the pilot, the second, the service tank (about 70 litres), is placed at the back of the pilot between him and the gun ring in the gunner's cockpit. The quantity of fuel carried allows of a flight of four hours' duration. The covering over the engine leaves the top of the cylinders exposed, and encloses a Spandau machine gun operated by the motor.

The exhaust pipes run from the six cylinders to a common chimney, curving upwards and backwards. The chimney itself is divided, about half way up, into three branches, probably in order to obtain a certain amount of silencing effect. As in previous models, the radiator, which is semi-circular in shape, is placed on the front legs of the cabane. In front of it is a series of small slats, which can be moved so as to be either parallel to or at right angles to the direction of flight. This is, of course, done in order to make it possible for the pilot to adjust the cooling according to the altitude at which he is flying.

Behind the motor is the pilot's cockpit, and behind him again that of the gunner. Supported on a gun ring in the rear cockpit is a Parabellum machine gun. Pilot and gunner are very close together. In the gunner's cockpit there is a bomb rack of the usual type, carrying four bombs. An opening in the floor permits of taking photographs, and the machine carries a wireless set. The landing chassis is of the V type, with rubber shock absorbers. There is no brake fitted on this machine. An external drift cable runs from the nose of the fuselage to the foot of the inner front interplane strut.—*Courtesy of L'Aerophile.*



Rumpler "C.IV" German general utility biplane. Above, using a 260 H.P. Mercedes engine and below with a 250 H.P. Maybach.


GERMAN "TYPE C.IV"
RUMPLER
260 H.P. 1917 BIPLANE
Scale of feet
1 2 3 4 5 6 7 8 9 10 11 12
McLaughlin

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Board

(Continued from January number)

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications in addition to those printed in our 1083 issue

Specifications for Square and Round Bevel Washers
(4P5 December 1917)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Use.—2. These washers are to be used on bolts (I. A. S. B. specification 4P3).

Material.—3. The washers shall be machined from cold-rolled or drawn steel (I. A. S. B. specification 3S20).

Manufacturer.—4. The washers may be cut by shearing if this can be done without distorting the surface. They shall be cyanide hardened. The washers shall be copper-plated in a cyanide bath and then nickel plated; the coating shall not exceed 0.001 inch (0.0254 mm.) in thickness.

Workmanship and Finish.—5, Both sides must be flat and free from bars.

Physical Properties and Tests.—6. Washers selected for the bend test shall be firmly clamped in a square-nose vise and bent through an angle of 30 degrees. They shall withstand this bending without cracking. One of every 250 washers shall be subjected to the bend test.

Dimensions and Tolerances.—7. The washers shall be of the form shown in figures 1 and 2 and shall conform to the dimensions within the tolerances given in following table. The values represent the finished dimensions after copper and nickel plating.

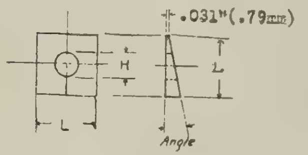


Fig. 1.—Square washer.

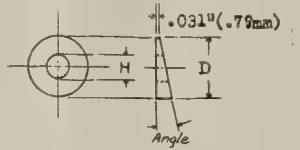


Fig. 2.—Round washer.

Delivery, Packing, and Shipping.—8. The washers shall be delivered in boxes of gross weight not exceeding 50 pounds (22.7 kg.). The lots of individual sizes shall be packed in strong manila envelopes or cartons.

Dimensions and tolerances for bevel washers.

[Values of angle are 6, 12, 24, or 36 degrees for all sizes.]

Bolt size.		H.		D.	L.	Bolt size.	H.	D.	L.
No.	*Inch.*	*No.*	*Inch.*	*Inch.*	*Inch.*	*Millimeters.*	*Millimeters.*	*Millimeters.*	*Millimeters.*
4	0.112	31	0.120	0.375	0.375	2.85	3.05	9.53	9.53
6	.138	26	.147	.438	.375	3.51	3.73	11.11	9.53
8	.164	17	.173	.469	.469	4.17	4.39	11.91	11.91
10	.190	8	.199	.500	.469	4.83	5.05	12.70	11.91
12	.216	1	.228	.563	.531	5.49	6.09	14.29	13.49
......	.250	......	.266	.625	.531	6.35	6.75	15.88	13.49
......	.312	......	.328	.688	.656	7.93	8.33	17.46	16.67
......	.375	......	.391	.750	.656	9.52	9.92	19.05	16.69
......	.437	......	.453	.938	.875	11.11	11.50	23.81	22.23
......	.500	......	.516	1.000	.875	12.70	13.10	25.40	22.23

Specifications for Plain, Ball, and Castle Hexagon Nuts for Aircraft
(4P4 December 1917)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Use.—2. These nuts are to be used on bolts (I. A. S. B. specification 4P3).

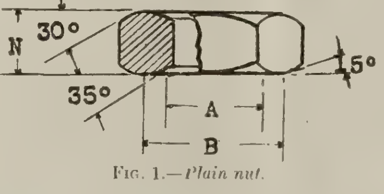


Fig. 1.—*Plain nut.*

Note—Thread chamber to be omitted on sizes smaller than 0.250 inch diameter.

Material.—3. The nuts shall be machined from cold-rolled or drawn steel, I. A. S. B. specification 3S20.

Manufacture.—4. The nuts shall be cyanide hardened. The nuts shall be copper-plated in a cyanide bath and then nickel-plated; the coating shall not exceed 0.001 inch (0.0254 mm.).

Workmanship and Finish.—5. The inside face shall be flat and free from burrs.

Physical Properties and Tests.—6. Nuts shall withstand having inside diameter increased 25 per cent by drifting without cracking. One per cent of each size of all nuts shall be subjected to the drift test.

Dimensions and Tolerances.—7. The nuts shall be of the form shown in figures 1, 2, and 3 and shall conform to the dimensions within the tolerances given in Tables 1, 2, and 3. The values represent the finished dimensions after copper and nickel plating.

Table 1.—*Dimensions and tolerances for plain nuts.*

A, Bolt size.	B, Width across flats.	N, Thickness.	A, Bolt size.	B, Width across flats.	N, Thickness.
Inches.	*Inches.*	*Inch.*	*Millimeters.*	*Millimeters.*	*Millimeters.*
0.112	0.250	0.094	2.85	6.35	2.38
.138	.313	.109	3.51	7.94	2.78
.164	.375	.125	4.17	9.53	3.18
.190	.375	.141	4.83	9.53	3.57
.216	.438	.156	5.49	11.11	3.97
.250	.438	.188	6.35	11.11	4.76
.313	.500	.234	7.94	12.70	5.95
.375	.563	.281	9.53	14.29	7.14
.438	.688	.328	11.11	17.46	8.33
.500	.750	.375	12.70	19.05	9.53
.563	.875	.422	14.29	22.23	10.72
.625	.938	.469	15.88	23.81	11.91
.688	1.000	.516	17.46	25.40	13.10
.750	1.063	.563	19.05	26.99	14.29
.875	1.250	.656	22.23	31.75	16.67
1.000	1.438	.750	25.40	36.51	19.05

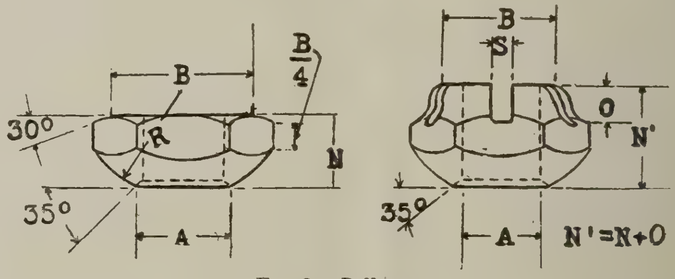


Fig. 2.—*Ball nut.*

Note.—Thread chamfer to be omitted on sizes smalles than 0.250 inch diameter.

Table 2.—*Dimensions and tolerances for ball nuts.*

Ball hexagon.				Ball castle.			
A, Bolt size.	B, Width across flats.	N	R	B	N'	S.	O
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
0.164–32	0.375	0.172	0.375	0.375	0.250	0.078	0.078
.190–32	.375	.172	.375	.375	.250	.078	.078
.216–32	.438	.172	.375	.438	.266	.078	.094
.250–28	.438	.203	.375	.438	.297	.078	.094
.313–24	.500	.250	.375	.500	.344	.078	.094
.375–24	.563	.313	.500	.563	.438	.125	.125
.438–20	.688	.359	.500	.688	.484	.125	.125
.500–20	.750	.375	.500	.750	.563	.125	.188
Mm.	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*
4.17–32	9.53	4.37	9.53	9.53	6.35	1.98	1.98
4.83–32	9.53	4.37	9.53	9.53	6.35	1.98	1.98
5.49–32	11.11	4.37	9.53	11.11	6.75	1.98	2.38
6.35–28	11.11	5.16	9.53	11.11	7.54	1.98	2.38
7.94–24	12.70	6.35	9.53	12.70	8.73	1.98	2.38
9.53–24	14.29	7.94	12.70	14.29	11.11	3.18	3.18
11.11–20	17.46	9.13	12.70	17.46	12.30	3.18	3.18
12.70–20	19.05	9.53	12.70	9.05	14.29	3.18	4.76

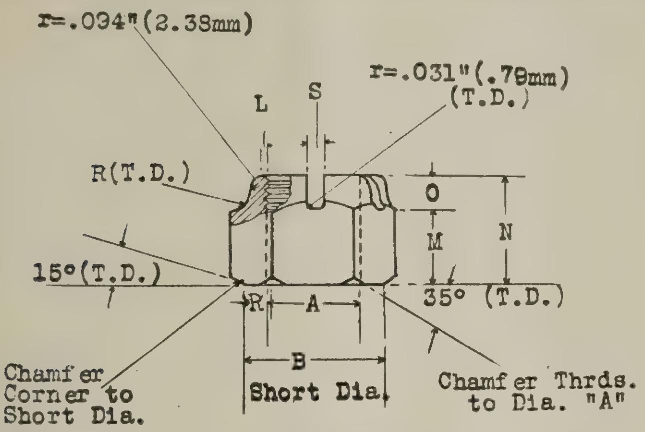


FIG. 3.—*Castle hexagon nut.*

NOTE.—Thread chamfer to be omitted on sizes smaller than 0.025 inch diameter.

TABLE 3.—*Dimensions and tolerances for castle hexagon nuts.*

A, Bolt size.	B, Width across flats.	N	S	O	M	L	R
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
0.164-32	0.375	0.234	0.078	0.078	0.156	0.016	0.094
.190-32	.375	.250	.078	.078	.172	.016	.094
.216-32	.438	.266	.078	.094	.172	.031	.094
.250-28	.438	.281	.078	.094	.188	.031	.094
.313-24	.500	.328	.078	.094	.234	.031	.094
.375-24	.563	.406	.125	.125	.281	.031	.094
.438-20	.688	.453	.125	.125	.328	.047	.125
.500-20	.750	.563	.125	.188	.375	.047	.125
Mm.	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*	*Mm.*
4.17-32	9.53	5.95	1.98	1.98	3.97	0.40	2.38
4.83-32	9.53	6.35	1.98	1.98	4.37	.40	2.38
5.87-32	11.11	6.75	1.98	2.38	4.37	.80	2.38
6.35-28	11.11	7.14	1.98	2.38	4.76	.80	2.38
7.94-24	12.70	8.33	1.98	2.38	5.95	.80	2.38
9.53-24	14.29	10.32	3.18	3.18	7.14	.80	2.38
11.11-20	17.46	11.50	3.18	3.18	8.33	1.19	3.18
12.70-20	19.05	14.29	3.18	4.76	9.53	1.19	3.18

Delivery, Packing, and Shipping.—8. The nuts shall be delivered in boxes of gross weight not exceeding 50 pounds (22.7 kg.). The lots of individual sizes shall be packed in strong manila envelopes or cartons.

Specifications for Construction of Aeroplane Propellers
(4E1 February 1918)

General.—1. The general specifications, 1G1, shall form, according to their applicability a part of these specifications.

Materials.—2. (*a*) *Wood.*—Woods for the manufacture of propellers for motors of more than 150 horsepower, or more than 1,600 revolutions per minute, are to be black walnut, true mahogany, or quarter-sawed white oak.

For machines under 150 horsepower and 1,600 revolutions per minute, will also be allowed the use of West African mahogany, cherry, and birch. In any case, the manufacturer is not allowed to use a different material from that specified in the design without permission of the purchaser.

Thickness of the boards shall be 0.75 to 1.0 inch, finished.

(*b*) The laminations of the propellers being of irregular shape, imperfections are allowable on edges and parts of boards that will be cut away in the shaping of the propellers, but the stock that goes into the propeller must be straight grain, free from curls, burls, and spiral grain, without knots, checks, dry rot, shakes, dote, or other imperfections, in entire accordance with the I. A. S. B. specifications Nos. 2W3-8 for the lumber.

Sapwood is not permitted in the finished blade, and is not allowed to extend in boss more than 0.75 inch from the edge of the boss, and must in that case be sound.

(*c*) The physical properties of the wood shall be as specified in the I. A. S. B. specification No. 3W1.

(*d*) Stock shall be dried to a moisture content of 7 per cent by methods given in the I. A. S. B. specification No. 3W2.

(*e*) The *glue* used shall conform to I. A. S. B. specification No. 2V2.

(*f*) Materials used for the *sheathing* of propellers for sea planes may be the following:

(1) Sheet copper in conformity to I. A. S. B. specification 3N8.
(2) Monel metal sheet in conformity to I. A. S. B. specification 3N21.
(3) Linen in conformity to I. A. S. B. specification 2F3.
(4) Cotton fabric in conformity to I. A. S. B. specification 2F4.

(*g*) The *spar varnish* used shall conform to I. A. S. B. specification 2V1; the *filler*, to I. A. S. B. specification 2V2. The priming varnish shall be made by dilution of spar varnish with about 2 parts of turpentine.

Manufacture.—3. (*a*) Each board shall be sawed and planed in accordance with blue prints. After planing they shall be glued promptly to avoid absorption of moisture, and great care must be taken to keep the wood under uniform conditions of temperature and humidity during all the operations.

(*b*) Boards shall be balanced before gluing, and heavy ends alternated so as to minimize the effect of variation in the density of the material.

(*c*) The boards shall be sawed for gluing in such a way that the grain follows the lamination of the propeller, avoiding any cross grain. At the same time, the boards shall be so arranged that the grain comes out on the edge, avoiding any flat grain.

(*d*) The practice of gluing edge pieces onto the boards in order to fill out at the boss is forbidden, unless special permission is given by the purchaser. In case such permission is given, the lamination on both ides of the boss widener must be of the full width of the boss; that is, no two laminations which have wideners glued to them shall be adjacent. Both the lamination and the boss widener shall be corrugated at the joint to increase the gluing surface. No splice or "dutchman" shall be permitted on the blade of the propeller. Defective joints shall not be filled with glue. The practice of gluing a thin strip of veneer to the blades will not be allowed.

(*e*) The glue room must be kept at a temperature of 90° to 100° F. (32° to 38° C.), and an average pressure in gluing of 150 pounds per square inch (0.11 kg./mm.^{2}) shall be maintained. Care shall be taken to insure an even pressure on all the parts of the glued surface for not less than 10 hours or longer, at the option of the purchaser. The pressure in the gluing process must not be removed before the expiration of 8 hours after it is completed. This period may be increased at the option of the purchaser.

(*f*) The propeller shall stand at least two days after gluing, nor shall it be finished in less than two weeks after roughing out.

(*g*) The surface of the propeller shall be smoothly sandpapered before the filler is applied, and the curvature shall be true and smooth throughout the length of the blade. Irregularities of contour are not permissible.

Tolerances.—4. (*a*) Propellers shall be inspected for pitch angle, alignment, blade form, and shape of section, as soon as they are finished by the manufacturer and shall come within the following tolerance limits:

	Portion of blades more than 50 per cent radius from axis.	Portion of blades less than 50 per cent radius from axis.
Alignment within.....	0.0625 inch...........	0.0625 inch.
Error in fit of templets	0.01 × width of blade..	0.02 × width of blade.
Width of blade........	0.075 × width of blade.	0.01 × width of blade.
Thickness of section..	0.0625 inch...........	0.125 inch.

For the inner half of the blade length the deviation from the specified pitch angle shall not exceed ± 1.0° at any station, and the difference between the pitch angles at corresponding stations on opposite blades must not differ by more than 1.0°. For the outer half of the blade length the average deviation shall not exceed ±0.3°, the maximum deviation shall not exceed ±0.5°, and the difference between corresponding opposite averages and maximum shall not exceed 0.3° and 0.5°, respectively.

(*b*) The diameter shall conform to the drawings within plus or minus 0.125 inch. The inspector may accept propellers when the diameter is 0.50 inch under specified dimensions, providing not more than 1 propeller in 10 is more than 0.125 inch under the specified diameter.

(*c*) Blades on the same propeller shall be alike within the limits given above. For example, the thickness of the blade may be 0.0625 inch greater or less than specified, but two blades on the same propeller shall not differ in thickness by more than 0.0625 inch.

(*d*) Propellers shall be inspected for alignment at the time of shipment and shall track within 0.0625. If the propeller is not over 0.315 inch out of track, it is permissible to correct the alignment by scraping the wood in the boss.

Sheathing of Propeller with Fabric.—5. (*a*) Before application the fabric shall be scrubbed thoroughly with hot water and soda, and after rinsing allowed to soak in hot water for four hours in order to remove all sizing from the cloth.

(*b*) The process shall be repeated until all the sizing is removed. The cloth shall be dried and applied to the blade in the glue room, with a standard temperature of 100° F.

(*c*) The blades shall be coated evenly with glue, and the cloth applied and ironed smooth, preferably with an electric iron.

(*d*) Twenty-four hours after gluing the fabric shall be given four coats of acetate dope, followed by two coats of varnish or enamel which conforms to I. A. S. B. specifications No. 2V1.

Sheathing of Propellers with Copper or Naval Brass.—6. (*a*) Metal sheathing shall be set in flush with the blade. Rivets of the same material as the sheathing shall be spaced over the area of the sheathing. They shall be applied in such a way as to fit tightly without splitting the wood and shall be applied alternately from the face and the back. The rivets shall then be headed and filed to form a smooth surface. No rivets shall be driven closer than 1 inch from the propeller edge, except at the edge of the metal or in very small blades.

(*b*) A row of rivets about 0.625 inch apart shall be spaced along the edge of the sheathing.

(*c*) The rivets shall not exceed 0.085 inch in diameter and shall show a breaking load of at least 130 pounds (58.9 kg.) at the riveted end and 180 pounds (81.5 kg.) at the head end. The working stress due to centrifugal force shall not exceed 4,266 pounds per square inch (3 kg./mm.^{2}).

(*d*) Sheathing shall be formed to the exact shape of the blade before any rivets are placed.

(*e*) The rivets shall be applied in such a way that they do not follow the line of the grain.

(*f*) When the work is complete the tip shall fit snugly against the wood. Buckling or lifting of the metal shall be considered ground for rejection.

(*g*) Sheathing shall be perforated at the extreme tip by four holes 0.0625 to 0.0938 inch in diameter, to allow the moisture to be removed.

Finishing of Propellers.—7. Propellers shall be finished by the application of 1 coat filler, 2 coats priming varnish, and 3 coats of spar varnish. Each coat should be allowed sufficient time to dry before the application of the next coat.

Balancing of Propellers.—8. (*a*) The propellers shall be tested for balance after the shaping, and after each subsequent operation which effects the balance. For this test the propeller shall be mounted so that it can turn on a horizontal axis, and the sensitiveness of the mounting must be such that it will move at the application of 1 gram (equal 0.036 ounce) at a distance of 2 feet (61 cm.) from the axis.

(*b*) The balancing shall be done in a room free from air currents.

(*c*) The propeller when completed shall stand on the balancing machine in any position without persistent motion in any direction.

Testing of Propellers.—9 (*a*) One propeller of each new design shall be tested by running for at least 10 hours at rated speed on the engines for which it was designed.

(*b*) A centrifugal test of at least one hour duration shall be run at a speed of 10 per cent in excess of the rated speed. This test applies to one propeller of each new or of each unconventional design and to propellers made by inexperienced builders.

(*c*) The deflection of the tip in the axial direction shall not exceed 0.75 inch when the propeller is turning in free air at the rated speed unless greater deflection is an intended feature of the design. This requirement applies to propellers having a diameter of less than 10 feet (3.05 m.).

(*d*) Such additional tests as may be desired shall be stipulated for propellers of untried materials or of radical design, or larger than 10 feet.

HUBBING OF PROPELLERS.—10. (*a*) The large boss hole shall be bored before roughing and shaping in order to insure perfect alignment.

(*b*) The fit of the hub in the large hole shall be neat and close, and the metal flange shall not show perceptible shake. The fit of the bolts in the wood shall be as tight as possible without danger of splitting the wood.

MARKING OF PROPELLERS.—11. (*a*) The propellers shall be stamped in such a position on the boss as to be legible after the placing of the metal flange, with the following information: (1) Pitch, (2) diameter, (3) safe revolutions per minute, (4) whether right or left hand, and (5) serial number.

(*b*) On the blade shall be the manufacturer's trade-mark or name. (4E2, February, 1918.)

Specifications for Valve Forgings
(3S38 January 1918)

GENERAL.—1. The general specification. 1G1, shall form, according to their applicability, a part of these specifications.

MATERIAL.—2. The steel from which these forgings are made shall be chosen from the I.A. S. B. standard steels listed below. The composition chosen shall be stated by the manufacturer or contractor.

For exhaust valves, steel W60, W60*a*, or 51230 shall be used.

For inlet valves, steel W60*b*, X3340, or X3440 may be used and shall conform to the requirements of specification 3S3.

MANUFACTURE.—3. The forgings shall be annealed before machining or heat treating.

WORKMANSHIP AND FINISH.—4. (*a*) The forgings must be uniform in quality, free from pipes, laps, cracks, twists, and seams, and must have a workmanlike finish.

(*b*) A forging may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected forgings shall be returned to the manufacturer at his expense. This clause shall not apply to forgings fabricated after export.

PHYSICAL PROPERTIES AND TESTS.—5. The forgings shall be capable of developing the following physical properties when heat treated:

(*a*) Forgings from steels W60 or W60*a* shall show the following hardness:

Brinel Hardness number	320 to 370
Shore scleroscope hardness number	55 to 65

TENSILE STRENGTH

	Forgings from steel 51230.		Forgings from steel W60*b*, X3340, or X3440	
	Pounds per square inch.	Kilograms per square millimeter.	Pounds per square inch.	Kilograms per square millimeter.
Minimum tensile strength	90,000	63.27	225,000	158.18
Minimum yield point	67,500	47.45	180,000	126.54
Minimum elongation in 2 inches (50.8 mm.)	18 per cent.		30 per cent.	
Minimum reduction of area	9 per cent.		50 per cent.	

Brinell Hardness Test.—(*c*) The Brinell hardness test shall be made after the tensile test has been met. The procedure shall be as follows: Hardness tests shall be made on the forgings selected for the tensil tests and must agree within 3 per cent. The hardness values of other forgings in the same lot must agree with the average of the values so obtained within 3 per cent.

SELECTION OF TEST SPECIMENS.—6. (*a*) Two per cent of the forgings shall be taken for the tensile test.

(*b*) A hardness test may be required on each forging offered. At least 25 per cent of the pieces in each lot shall be tested for hardness.

(*c*) All forgings in a lot shall be heat treated at the same time, and if possible shall be from the same heat of steel.

DIMENSIONS AND TOLERANCES.—7. The forgings shall conform to the dimensions on the drawings within the tolerances specified. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving trace of original surface.

PACKING, SHIPPING, AND DELIVERY.—8. The forgings shall be boxed for shipment; the gross weight of individual boxes must not exceed 220 pounds (100 kg.) gross weight.

Chemical composition of steels.

NICKEL-CHROMIUM STEELS.

Number.	Carbon.	Manganese.	Phosphorus, maximum.	Sulphur, maximum.	Nickel.	Chromium.
X3340	0.35-0.45	0.45-0.75	0.040	0.045	2.75-3.25	0.70-0.95
X3440	.35- .45	.30- .60	.040	.045	4.00-5.00	1.00-1.50

CHROMIUM STEEL.

Number.	Carbon.	Manganese, maximum.	Phosphorus, maximum.	Sulphur, maximum.	Nickel.	Chromium.
51230	0.20-0.40	0.50	0.035	0,035	None.	11.50-14.00

TUNGSTEN STEELS.

Number.	Carbon.	Manganese, maximum.	Phosphorus, maximum.	Sulphur, maximum.	Chromium.	Tungsten.
W60	0.50-0.70	0.30	0.035	0.035	3.00-4.00	13.00-15 00
W60*a*	.50- .70	.30	.035	.035	3.00-4.00	16.00-18.00
W60*b*	.50- .70	.30	.035	.035	.50-1.00	1.50- 2.00

GENERAL.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

USE.—2. These tubes are suitable for aeroplane axles and structural members.

MATERIAL.—3. The material for these tubes shall be chosen from the I. A. S. B. standard steels listed below.

MANUFACTURE.—4. (*a*) The tubes shall be cold drawn and shall be furnished heat treated.

Heat Treatment.—(*b*) The tubes shall be heat treated to meet the physical properties specified. The quenching shall be done in oil. Tubes which fail to meet the physical tests may, at the option of the purchaser, be reheat treated.

(*c*) Any tube may be rejected at any time because of injurious defects or faults in the steel which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected tubes shall be returned to the manufacturer at the latter's expense. This clause shall not apply to materials fabricated after export.

WORKMANSHIP AND FINISH.—5. The tubes are to be smooth, of the section specified, and within the permissible tolerances as to wall thickness; of uniform diameter, free from scale, dirt, specks, longitudinal seams, laminations, grooves, and blisters, both internally and externally.

PHYSICAL PROPERTIES AND TESTS.—6. The tubes shall have the following physical properties:

Tensile Test.—(*a*)

	Pounds per square inch.	Kilograms Per square millimeter.
Minimum tensile strength	200,000	140.6
Minimum elongation in 2 in. (50.8 mm.)	5 per cent.	
Minimum elongation in 4 in. (101.6 mm.)	3 per cent.	

Bend Test.—(*b*) Each axle tube shall be supported as shown in Fig. 1 and a load applied near the unsupported end which will develop a tensile stress of 185,000 pounds per square inch (130.0 kg. per sq. mm.) in the highest stressed fibers of the tube. (See formula on p. 3.) The load shall be applied in two equal increments. After the first the deflection of the tube at *B* shall be measured. The second increment shall then be applied for at least five seconds, and removed, and the deflection at *B* again measured. In case the deflection has increased more than 0.0625 inch (1.59 mm.) the tube shall be rejected.

SELECTION OF TEST SPECIMENS.—7. *Tensile Test Specimens.*—(*a*) One tube for the tensile test shall be selected at random from each lot of 100 tubes or less. In case the net sectional area of the tubing exceeds 0.85 square inch (548.4 sq. mm.), two standard test specimens may be machined from the tube before heat treatment. These specimens shall then be heat treated with the lot of tubes they represent, and must show the physical properties specified.

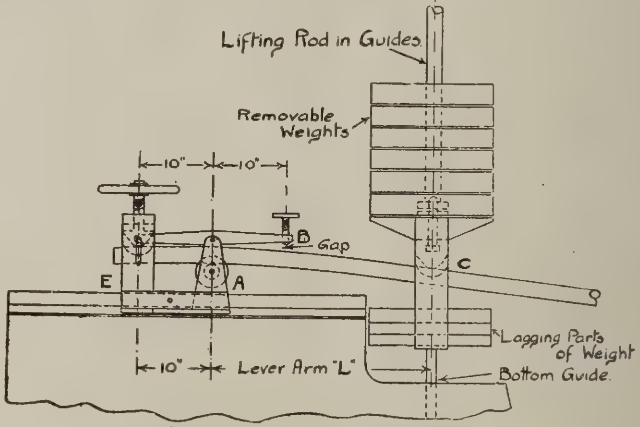


FIGURE 1.—*Diagram of axle-testing apparatus.*

Bend Test Specimens.—(*b*) One end of each tube shall be subjected to the bend test, and one tube in ten shall be tested at both ends.

DIMENSIONS AND TOLERANCES.—8. (*a*) The following tolerances will be allowed on the outside diameter of tubes:

Tubes 1.5 inches (38.1 mm.) diameter and under	0.003 inch (0.08 mm.)
Tubes over 1.5 inches (38.1 mm.) diameter	0.005 inch (0.13 mm.)

(*b*) The variation in wall thickness of tubes may be 10 per cent of the dimensions specified.

(*c*) In no part of any tub shall the departure from straightness exceed 1 in 600.

(*d*) Tubes shall be straightened before heat treatment. After heat treatment the tubes must not be restraightened until the bend test has been applied.

DELIVERY, SHIPPING, AND PACKING.—9. The tubes shall be well oiled and delivered in boxes not exceeding 220 pounds (100 kg.) gross weight.

Chemical compositions of standard alloy steels.

NICKEL STEELS.

Number.	Carbon.	Manganese.	Phosphorous, maximum.	Sulphur, maximum.	Nickel.
2330	0.25-0.35	0.50-0.80	0.040	0.045	3.25-3.75
2335	.30- .40	.50- .80	.040	.045	3.25-3.75

NICKEL-CHROMIUM STEELS.

Number.	Carbon.	Manganese.	Phosphorous, maximum.	Sulphur, maximum.	Nickel.	Chromium.
3130	0.25-0.35	0.50-0.80	0.040	0.045	1.00-1.50	0.45-0.75
3135	.30- .40	.50- .80	.040	.045	1.00-1.50	.45- .75
3140	.35- .45	.50- .80	.040	.045	1.00-1.50	.45- .75
3230	.25- .35	.30- .60	.040	.045	1.50-2.00	.90-1.25
3240	.35- .45	.30- .60	.040	.045	1.50-2.00	.90-1.25

IUM-VANADIUM STEELS.

Number.	Carbon.	Manganese.	Phosphorous, maximum.	Sulphur, maximum.	Chromium.	Vanadium minimum.
6130..................	0.25-0.35	0.50-0.80	0.040	0.045	0.80-1.10	0.15
6140..................	.35- .45	.50- .80	.040	.045	.80-1.10	.15

The extreme fiber stress shall be calculated from the following formula:

$$S = \frac{32\ WlD}{\pi(D^4 - d^4)}.$$

Where S = extreme fiber stress.
W = the load.
l = distance from support to load.
D = outside diameter of tube.
d = inside diameter of tube.

Specifications for Free Cutting or Screw Machine Brass Bars (3N22)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Use.—2. This material is to be used for screw machine work; it is not suitable for structural parts of aeroplanes and is intended only for use in machine parts not subject to considerable stress.

Material.—3. The bars shall have the following chemical composition:

	Per cent
Copper	60.0 to 63.0
Lead	2.25 to 3.25
Iron, not more than......................	.10
Other impurities, not more than..........	.25
Zinc	Remainder

Manufacture.—4. The brass shall be made from lake or electrolytic copper conforming to I. A. S. B. specification 2N2 and spelter of "C" or "D" grade conforming to I. A. S. B. specification 2N3. No scrap shall be used in the manufacture of these bars other than that produced in the manufacturer's own plants and which is of the same composition as the material specified.

Workmanship and Finish.—5. All bars shall be sound, straight, free from roaks, laps, cracks, twists, seams, and damaged ends, and are to have a workmanlike finish.

Physical Properties and Tests.—6. The bars shall have the following physical properties:

Tensile Test.—(a)

	Minimum tensile strength	
	Pounds per square inch	Kilograms per square millimeter
Bars less than 1 inch in diameter.............	55,000	38.6
Bars from 1 to 2 inches in diameter.........	50,000	35.1
Bars over 2 inches in diameter..............	45,000	31.6

Bend Test.—(b) The bars shall withstand being bent cold through an angle of 120 degrees to a radius equal to the diameter of the rod without cracking. The bend test bar shall be full size up to a diameter of 1.50 inches. Test bars of rods of larger diameter may be machined to a diameter of not less than 1 inch.

Selection of Test Specimens.—7. The bars shall be grouped into lots of not more than 500 pounds if of one-half inch or less in diameter, or into lots of 50 pieces if larger. A tensile-test specimen and a bend-test specimen shall be cut from one bar of each lot.

Dimensions and Tolerances.—8. Bars shall not vary in diameter more than the following amounts:

	Inch
For bars up to and including 0.375 inch in diameter..........	±0.0015
For bars from 0.375 inch up to and including 1 inch in diameter	± .0030
For bars over 1 inch in diameter..................................	± .0050

Delivery, Packing, and Shipping.—9. (a) Bars when ordered to any length shall be furnished in stock lengths unless specifically required that lengths be exact.

(b) Stock lengths will be as follows:
When ordered in 12-foot lengths, no length shall be less than 8 feet.
When ordered in 10-foot lengths, no length shall be less than 6 feet.
When ordered in 8-foot lengths, no length shall be less than 6 feet.
When ordered in 6-foot lengths, no length shall be less than 4 feet.

(c) When ordered to the lengths given above, the weight of lengths less than length ordered shall not exceed 40 per cent of any one shipment.

Specifications for Bronze Castings for Bearings (3N19)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Use.—2. These castings shall be used for small unlined bearings and bushings.

Material.—3. The castings shall have the following chemical composition:

	Per cent
Tin	10 to 11.5
Zinc	2 to 3
Iron, not more than	0.2
Lead, not more than	0.2
Copper.	Remainder

Manufacture.—4. (a) The bronze shall be made from lake or electrolytic copper conforming to I. A. S. B. specification 2N2 and pig tin having a purity of at least 99 per cent.

(b) No scrap shall be used in the manufacture of these castings other than that produced in the manufacturer's own plants and which is of the same composition as the material specified.

Workmanship and Finish.—5. Castings must be homogeneous and free from shrinkage cracks, spongy spots, blowholes, and foreign matter. Any castings developing defects in machining must be replaced by the manufacturer. The full weight of material in the original casting must be returned by the purchaser for each replacement.

Physical Properties and Tests.—6. Bronze castings for bearings shall have the following physical properties:

	Pounds per square inch	Kilogram per square millimeter
Minimum tensile strength..................	35,000	24.6
Minimum yield point.........................	19,000	13.3
Minimum elongation in 2 inches............	9 per cent	

Selection of Test Specimens.—7 (a) The test bars shall be cast to size either from the casting, if the size of the same will permit, or from a separate block. The test bar shall be connected with the casting or block by a 0.125-inch (3.18 mm.) gauge running the entire length of the test bar.

(b) The test bar shall be of such a form that it can be machined to the I. A. S. B. standard test bar. Its total length shall be not less than 6 inches (152 mm.). The diameter of the reduced section shall be approximately 0.57 inch over a length of 2.25 inches.

(c) At least two test bars shall be cast from each heat. Test bars and castings shall have the heat number cast or stamped upon them.

(d) One test shall be made to represent each heat, but in case of a flaw in the test bar or a break outside of the middle third of the gauge length, further tests may be made on extra test pieces, as provided for in the foregoing paragraph.

Dimensions and Tolerances.—8. All castings must be true to pattern; cores must be correctly placed. Surfaces which are to be machined shall admit of finishing to the required dimensions without leaving any trace of the original surface.

Specifications for Aluminum Alloy Tubing (3N17)

General.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Material.—2. The specific gravity of the aluminum alloy of this specification shall not be greater than 2.85.

Manufacture.—3. No scrap shall be used in the manufacture of this tubing other than that produced in the manufacturer's own plants and which is of the same composition as the material specified.

Workmanship and Finish.—4. The tubing shall be straight, clean, smooth, and free from all injurious defects both inside and outside.

Physical Properties.—5. *Tensile Test.*—(a)

	Minimum tensile strength		Minimum yield point		Elongation in 2 inches, per cent
	Pounds per square inch	Kilograms per square millimeter	Pounds per square inch	Kilograms per square millimeter	
Temper 1.....	55,000	38.6	35,000	24.6	12
Temper 2.....	50,000	35.1	25,000	17.6	20

Bend Test.—(b) A section of the tubing of a length approximately equal to the outside diameter of the finished tube shall withstand being flattened into an oval of which the minor interior axis shall not be less than 4 for temper 2, and 6 times for temper 1, the thickness of the wall of the original tube.

Hydrostatic Pressure Test.—(c) Each tube shall be subjected to a hydrostatic pressure which will develop a tensile stress of 7,000 pounds per square inch (4.92 kg./mm.^{2}) in the tube, but in no case shall a test pressure of more than 1,000 pounds per square inch (0.703 kg./mm.^{2}) be required. Each tube must withstand this test without cracks, flaws, leaks, or other defects such as bulging.[a]

[a] The pressure to be applied shall be calculated from the formula

$$P = \frac{7,000T}{R}$$

Where P = the hydrostatic pressure in pounds per square inch.
T = the thickness of the tube wall in inches.
R = the internal radius of the tube.

Selection of Test Specimens.—6. Each bar shall be subjected to a hydrostatic test. A tensile and a bend test specimen shall be taken from each 100 feet of tubing or lot of less than 100 feet.

Dimensions and Tolerances.—7. (a) The following tolerances shall be allowed on aluminum alloy tubing.

Outside diameter.—(b) For tubes less than 2 inches in outside diameter, ±0.003 inch; for tubes from 2 to 3 inches in diameter, ±0.005 inch.

Wall Thickness.—(c) The wall thickness of the tube shall be not less than the specified gauge and shall not be exceeded by more than 0.004 inch for tubes less than 0.008 inch in wall thickness, nor by more than 5 per cent for thicker tubes.

Variation.—(d) The variation in thickness, due to eccentricity of the bore may not exceed ±10 per cent of the specified wall thickness.

Length.—(e) When tubing is ordered in definite lengths, no length furnished shall be less than that specified.

THE USE OF SPRUCE IN AEROPLANE CONSTRUCTION

By J. A. NEWLIN

In Charge Section of Timber Mechanics Forest Products Laboratory,
Forest Service

BECAUSE spruce combines the qualities of lightness, great strength and stiffness per unit weight, and a considerable degree of toughness, it is of great value in the manufacture of aeroplanes where just such qualities are demanded. Wing beams and struts are usually made of spruce, cut in such shapes as will give the greatest strength with the lightest weight.

This paper deals with data obtained by the Forest Products Laboratory of the Forest Service. It gives some general information relative to the species and conditions of growth of spruce, the influence of moisture conditions on aeroplane stock, and the relation of density to moisture content, shrinkage, and strength. As density is recommended as the best criterion of strength properties, methods of determining density, or specific gravity, are included.

Species

Red spruce, Sitka spruce and white spruce are the species upon which data have been obtained, and which are known to be valuable for aeroplane construction. There is no material difference in the strength of these species, and the choice of one over another is based on other properties of the wood, such as clearness, straightness of grain, cost, etc.

Locality of Growth

The red and white spruces are eastern woods having a large range of growth east of the Mississippi and north of the Ohio. The Sitka spruce grows on the west coast, from Washington and Oregon to Alaska. Tests indicate that there is no material difference in Sitka spruce from difference localities. This species attains a much larger size than the eastern varieties, being, in fact, one of the largest North American trees. Conditions of growth, density of the woods, and numerous other influences which will be taken up herein have a direct bearing on the quality of spruce.

Rate of Growth

Very rapid growth spruce is usually productive of inferior material. Experiments show that, other things being equal, spruce shows greater strength with the greater number of annual growth rings, up to about 15 rings per inch. Above that point, there is no noticeable increase or decrease in strength, according to the number of rings. Wood with less than 8 or 10 rings per inch is usually considerably weaker and lighter.

Position in Tree

Very commonly there is a difference in strength in wood taken from near the butt of a tree and that taken from farther up in the trunk, and in most cases the weaker wood comes from the higher portions of the tree. But in the case of spruce the wood shows no difference with height, and, if other factors are equal, wood taken from far up in the trunk of the tree will be as good as that near the butt.

With respect to location in the cross section of the tree, wood immediately surrounding the pith center is usually light and weak, the strength and density increasing with the distance out from the center. The increase in density with distance out from the center, however, is not so marked as the increase in strength.

In trees above medium size, the density and strength do not continue to increase with the diameter.

Heart and Sap

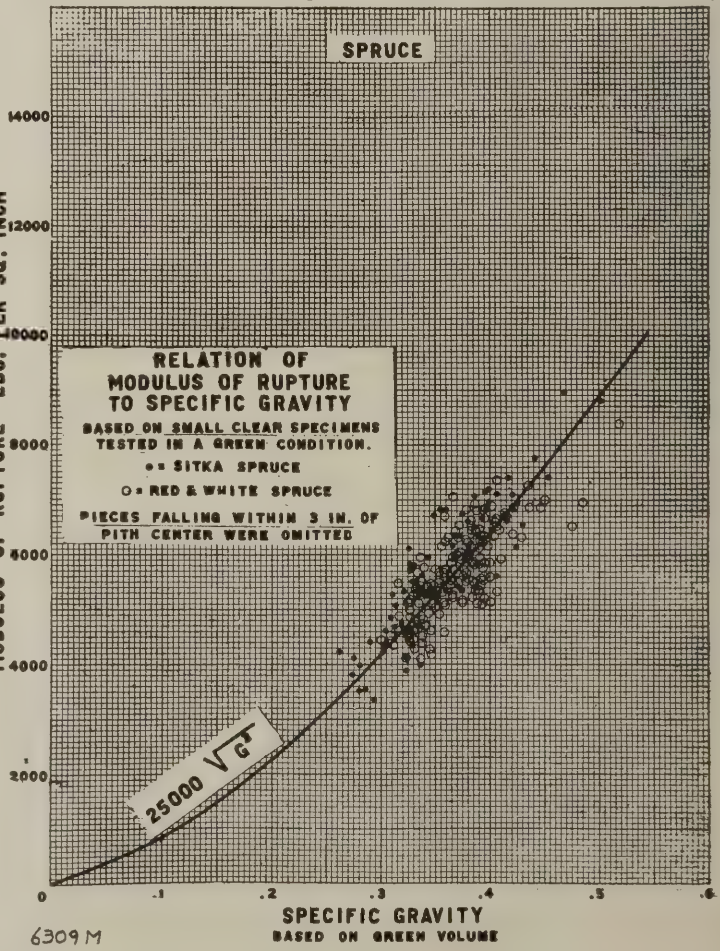
There are no indications of any change in strength due to the transition from the heart to the sapwood in the spruces.

Specific Gravity, or Weight, and Its Relation to Strength

The spruces follow the general law of timber in regard to strength properties and weight; i. e., all the strength values increase as the specific gravity increases. The closeness with which they follow this law, and the relation by which the strength may be estimated if the specific gravity is known, is shown by the two curves for modulus of rupture and maximum crushing strength. Where the oven-dry specific gravity for spruce, based on volue when green, is over .33, or over .36 when based on oven-dry volume, excellent material is obtained,—assuming, of course, that defects such as knots, spiral grain, etc., have been eliminated previously. Clear wood with the above specific gravities would seldom run below 4,500 pounds per square inch in modulus of rupture, or below 2,000 pounds per square inch in maximum crushing strength along the grain when green. Drying to the condition of airplane stock would increase these minimum strength figures to about 8,000 pounds and 4,000 pounds per square inch, respectively.

Variations in Moisture Content of Aeroplane Lumber

Lumber received at the aeroplane factory is of various sizes and conditions of seasoning. The material is used too rapidly to permit of long time storage and air seasoning under favorable conditions. As the lumber is cut into sizes approximately ready for the machine, it is run into conditioning chambers in which the seasoning of the lumber is hastened. A relatively short time elapses after the removal of the material from the conditioning chamber to its manufacture into finished size. Under such conditions there must of necessity be a wide variation in the moisture content of machined material. Some of the factors which influence this moisture content are variations in the original moisture content, position of the specimen in the pile, or conditioning chamber, and the difference in density of individual pieces which cause them to dry at different rates. It is the general observation that, of two pieces of the same species but differing in density, the lighter piece will dry the more rapidly. Observations made by the laboratory at various aeroplane plants would lead to the belief that a variation



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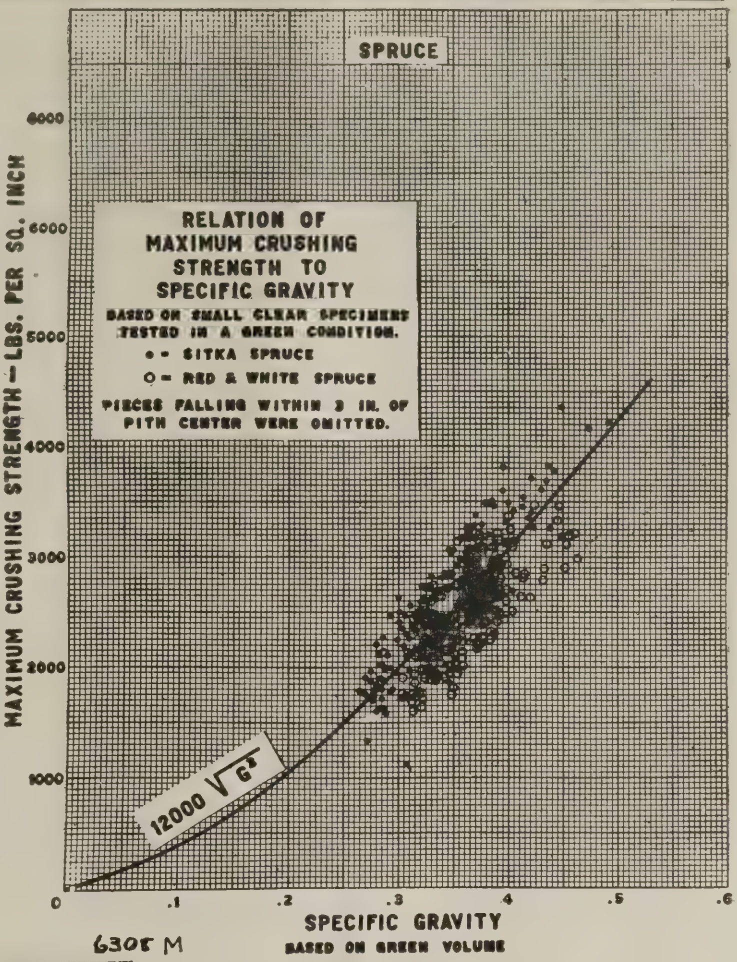
of as much as 10 per cent in the moisture content of the material as it goes through the machines may be expected, although no data on this point are available.

Influence of Changes in Moisture Content After Machining on the Size of the Finished Part

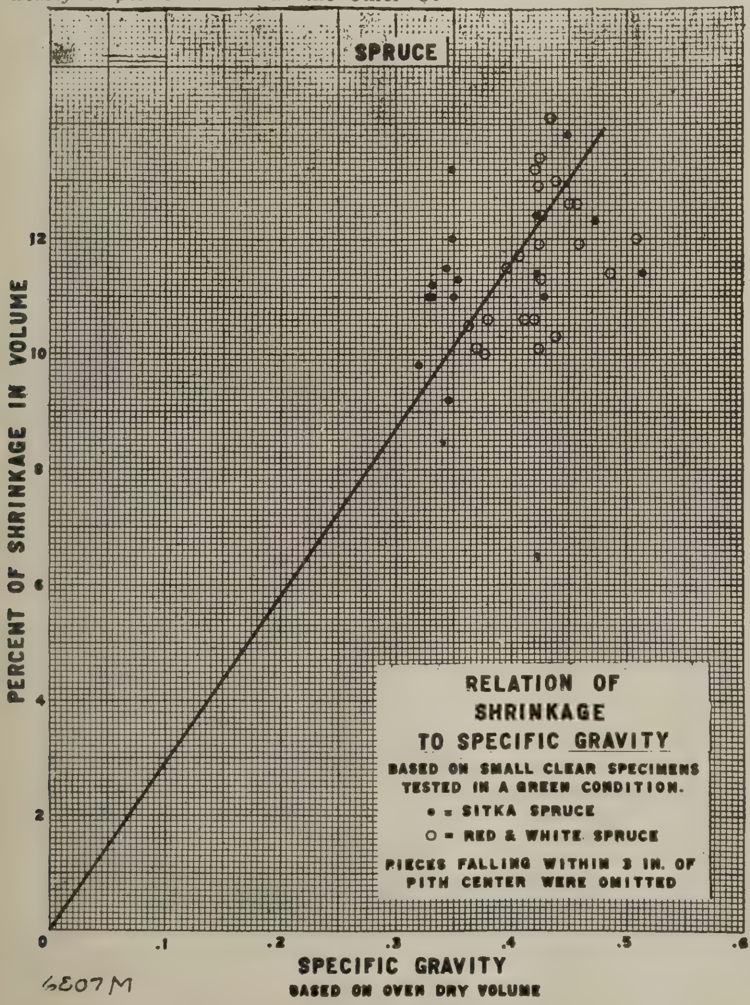
The accompanying chart gives the total shrinkage in volume of spruce from the green condition to the oven-dry condition, or zero moisture. About .6 of this amount would represent the tangential shrinkage and about .4 the radial shrinkage of the specimen.

Good spruce may be assumed to shrink about 12½ per cent from the green to the oven-dry condition. The ultimate moisture content of the airplane stock in service is probably in the neighborhood of 9 per cent moisture. Each change of 1 per cent moisture at about 9 per cent may be assumed to give about one-twentieth of the total shrinkage; that is, a 1 per cent change in moisture content of good spruce would give .6 of 1 per cent change in volume, equivalent to about .35 of 1 per cent in tangential shrinkage and .25 of 1 per cent radial shrinkage.

Were the material allowed to stand for several weeks at approximately the humidity condition of the assembling room before manufacture, it probably would all arrive at about a uniform and suitable moisture content. However, under the forced conditions which exist it is safe to assume that the better pieces of machined timber frequently have at least 5 per cent more moisture than they will ultimately have. This change of 5 per cent moisture which may take between the time of machining the part and its final use would cause a reduction in one dimension of nearly 2 per cent and in the other of nearly 1½ per cent. In a built-up propeller, any such changes in moisture condition of the finished product would certainly tend to split and twist it, since the different laminations containing different percentages of moisture would shrink unequally. This variation of 2 per cent in a single direction could also be produced by differences of humidity between a warm, dry season of weather lasting for two or three weeks as against a moist atmosphere for the same length of time. As may be seen by the diagram, spruce tends to show a greater shrinkage in heavier pieces than in light pieces. Consequently, pieces of low weight which would be considered of low quality would not cause so much trouble from shrinkage as the heavier and stronger pieces.



RELATION OF MAXIMUM CRUSHING STRENGTH TO SPECIFIC GRAVITY
BASED ON SMALL CLEAR SPECIMENS TESTED IN A GREEN CONDITION.
● = SITKA SPRUCE
○ = RED & WHITE SPRUCE
PIECES FALLING WITHIN 3 IN. OF PITH CENTER WERE OMITTED.



RELATION OF SHRINKAGE TO SPECIFIC GRAVITY
BASED ON SMALL CLEAR SPECIMENS TESTED IN A GREEN CONDITION.
● = SITKA SPRUCE
○ = RED & WHITE SPRUCE
PIECES FALLING WITHIN 3 IN. OF PITH CENTER WERE OMITTED

From the foregoing remarks it will be seen that, by throwing out material on account of a very slight under size, except where the dimensions are taken immediately after machining, higher quality pieces are likely to be excluded.

Influence of Changes in Moisture Content Upon Strength

Under the varying conditions of moisture as given above, the random selection of specimens for strength tests is to be discouraged, since the moisture content of the specimen has a tremendous influence on the strength. For example, 1 per cent of moisture causes approximately 5 per cent difference in the crushing strength parallel to the grain. As light pieces may come to a low moisture content and the heavy pieces to a relatively high moisture content at the time of machining, although the ultimate moisture content in service will probably be about the same, specimens taken under such conditions will give abnormally high values for poor material and low values for good material. The tests, therefore, become of practically no value unless corrections are made for moisture.

FOREIGN NEWS

FRANCE

The French official announcement of March 17th reports the following aerial activities:

"On March 16th one German aeroplane was destroyed and four others damaged severely by French aviators. Our bombing squadrons dropped 7,000 kilograms of projectiles on military establishments behind the enemy front."

The night announcement of the 17th concludes as follows:

"On Saturday our pilots destroyed two German aeroplanes. Five other enemy machines fell within the German lines. Information now at hand shows that on March 13th and 15th four German aeroplanes, in addition to those previously reported, were brought down."

Extensive bombing operations are reported in the activities of March 18th, as follows:

"On Sunday three German aeroplanes were destroyed and six others were badly damaged by our pilots. A captive balloon was set on fire by one of our aviators. Furthermore, it has been learned that two other German aeroplanes were brought down on March 15th and 16th. Our bombarding squadrons threw down 6,000 kilograms (6.6 tons) of explosives on Saturday and 5,000 kilograms (5.5 tons) on Sunday on cantonments, other military establishments and railway stations of the enemy.

Successful bombing operations occurred on the 19th, according to the announcement of March 20th:

"Bad weather yesterday impeded aerial operation. Information now at hand shows that the six German aeroplanes and one captive balloon reported as having been damaged on the preceding day in reality were destroyed by our pilots.

"Our bombarding squadrons yesterday and the day before, operating as freely by day as by night, threw down 13,000 kilograms (28,600 pounds) of projectiles on military establishments, aviation grounds and railway stations in the enemy zone. Several explosions and two fires were observed in buildings bombarded."

The French official day report of March 22nd says that "it has been established that on March 5th, Sub-Lieutenant Harbelin brought down his tenth German aeroplane."

The night report of the 22nd says:

"Two German aeroplanes were destroyed and four badly damaged in a series of combats with our air squadron. Three enemy machines were shot down by our special artillery."

The announcement of the 23rd says:

"In the period from March 11 to March 20 twenty-six German aeroplanes and one captive balloon were shot down by our aviators. Nineteen enemy machines were seriously hit and brought down within the enemy lines. On March 22 five German aeroplanes were shot down or gravely damaged by our aerial units.

"On the night of March 22-23 our raiding squadrons dropped 35,200 pounds of projectiles upon establishments, cantonments and railroad terminals in the enemy zone. It was ascertained that the damage done was very great."

GERMANY

In the announcement of March 18th the Germans summarize aerial activity for the month of February, as follows:

"On the whole front the aerial activity was very marked. The French bombed hospital establishments at Le Thour, which were clearly recognizable as such. Yesterday we shot down twenty-two enemy aeroplanes and two captive balloons.

"In February the losses of the enemy aerial forces on the German front amounted to eighteen captive balloons and 138 aeroplanes. Fifty-nine of these aeroplanes fell behind our lines and the remainder beyond the enemy positions. In aerial encounters we lost sixty-one aeroplanes and three captive balloons."

GREAT BRITAIN

Intense aerial activity was described in the War Office statement of March 18th, as follows:

"A good visibility on Sunday enabled our aviators to increase their work in the air. The railway sidings at Somain and hostile rest billets on all parts of the front and three of the enemy's aerodromes were heavily bombed, a total of ten and one-half tons of bombs being dropped. Over one of the aerodromes attacked a fierce encounter took place, as the result of which three hostile aeroplens were destroyed our own suffering no losses.

"During to-day eighteen German machines were downed, eight driven down out of control and an observation balloon destroyed. Four of our machines are missing.

"Our night flying machines dropped five tons of bombs on two hostile aerodromes, one of which was occupied by large bombing machines, and also on a big ammunition dump northeast of St. Quentin and on billets in the neighborhood of Douai and Menin."

The announcement of March 19th reports further intense aerial activity on the part of the British air service, as follows:

"Nine tons of bombs were dropped Monday on enemy rest billets and ammunition dumps and also the Busigny railway station and two aerodromes, one of which was occupied by large bombing machines.

"Aerial fighting was exceedingly intense, encounters occurring between large formations. Nineteen German aeroplanes were destroyed, and nine were driven out of control. Twelve of our machines are missing.

"Six hundred bombs were dropped during the night on two aerodromes used by enemy night flying machines and on ammunition dumps and billets. All our machines returned."

Cloudy weather on March 20th almost prevented aerial activity, says the official report on aviation.

"After dark the weather cleared and hostile aerodromes southwest of Tournal and a large ammunition depot northeast of St. Quentin were bombarded, three hundred bombs being dropped."

British aircraft during the fighting along the front in France on March 22nd:

"The mist over the whole front Thursday morning cleared locally later, but at most places the weather was unsuitable for low flying. The enemy's attacking troops and reinforcements on the battle front offered excellent targets to the pilots of our low flying machines, which poured many thousands of rounds into them, causing innumerable casualties.

"Our bombing machines also attacked these targets, in addition to bombing important railway stations on the battle front, more than one hundred bombs being dropped.

"A great deal of fighting occurred at low altitudes, in which sixteen hostile machines were downed and six driven down out of control. A hostile balloon was destroyed by one of our pilots. One ot the enemy's low flying aeroplanes was shot down in our lines by infantry. Three of our machines are missing.

"During the night, night flying squadrons in the southern area of the front were unable to leave the ground owing to the mist. In the northern area, where the weather was clear, our aeroplanes dropped 3½ tons of bombs on the dockyards at Bruges and 3½ tons of bombs on rest billets northwest of Tournai. All of our machines returned."

The official report on the aerial operations, issued March 24th, says that fifty-four enemy aeroplanes have been brought down.

"The enemy's low flying aeroplanes were most persistent in their attacks on our infantry in the forward areas. Many of these machines were attacked and brought down by our pilots. A total of twenty-nine hostile machines were brought down and twenty-five others were driven down out of control. Two enemy balloons also were destroyed. Nine of our machines are missing.

"Our machines on Saturday carried out another successful raid on factories in Mannheim. Nearly one and a half tons of bombs were dropped, and bursts were seen on a soda factory, the railway and docks.

"Several fires were started, one of which was of great size, with flames reaching to a height of 200 feet and smoke to 5,000 feet. The conflagration was visible for a distance of thirty-five miles."

"The weather Saturday again favored operations, and our aeroplanes were constantly employed in reconnoitring positions of troops, in photography and bombing and in reporting suitable targets for our artillery. Many thousands of rounds were fired by our pilots fom low altitudes on hostile troops massed in villages and in the open continuously throughout the day.

"More than fourteen tons of bombs were dropped on enemy billets, on his high velocity guns and on railroad stations in the battle area."

"Our bombing aeroplanes were attacked by thirty-two hostile machines, and a fierce fight ensued. One of the enemy's aeroplanes was brought down in flames and another was downed, and fell in the centre of Mannheim. Five others were driven down out of control.

"Despite this severe combat and the enemy's heavy anti-aircraft gunfire all our machines returned except two. During the night ten heavy bombs were droppen on an important railway bridge and works at Konz, just south of Treves, in Germany. Eight of these bombs were clearly seen to be bursting among the railway works.

"Nearly two tons of bombs were dropped from low heights on a hostile aerodrome south of Metz. Six bombs were seen to burst among the hangars and to set fire to some of the huts of the aerodrome. All our machines returned.

"From nightfall until early morning our night flying squadrons bombed areas on the battlefront in which hostile troops were concentrated, as well as enemy ammunition dumps and large guns. More than fourteen tons of bombs were again dropped by our machines, two and a half tons of which were loosed on the docks of Bruges. All our machines returned."

The War Office on March 21st issued a statement on operations in Palestine as follows:

"We occupied Beit Rilma and Kefrtut, both east-southeast of Deir Ballett, unopposed. We drove off a counter attack at Deir Ballett and secured Elowsallabeh and the high ground to the westward.

"Airmen dropped 470 bombs on establishments in the vicinity of Elkutrani station. Direct hits were observed on the objectives."

British naval aeroplanes from Dunkirk destroyed five German machines between March 13th and 17th. Five other machines were brought down and two enemy observers were killed. All the British machines returned safely.

"On March 19th a British seaplane patrol, flying in Heligoland Bight, encountered two enemy seaplanes ten miles northeastward of Borkum," says an Admiralty announcement.

"The enemy was engaged and one of his machines was driven down in flames. Our machines returned safely."

ITALY

On March 18th it was announced that:

"Five hostile aeroplanes were brought down by our aviators. Last night a naval airship bombed an enemy aviation ground."

The destruction of seven enemy planes is announced on March 19th:

"Seven enemy aeroplanes were brought down yesterday, two by the Italians, two by the French, and three by the British."

Destruction of enemy aircraft is announced on March 20th:

"Our aviators set fire to two enemy captive balloons at Conegliano and Col Mirano. Two hostile aeroplanes were brought down, one by French aviators at San Giacomo di Veglia and the other by British airmen on the Asiago Plateau."

The announcement of March 22nd reports the following aerial activity:

"On the Asiago Plateau French and Italian aeroplanes brought down an enemy aeroplane. Beyond the Piave the British aviators brought down three enemy aeroplanes and forced another to land. Southward of Motta di Livena a captive balloon was set afire by our artillery.

"Our aircraft dropped bombs on railway lines in the Lagarina Valley," says the announcement of the 23rd.

American aviation students now in Italy will co-operate with Italians in aerial defense, it was announced on March 22nd.

MODEL NEWS

Edited by G. A. Cavanagh

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
:/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

The Davies Glider No. 2

THE following description of Mr. Davies' Glider was sent to "Flight" and is so full of interest and information that we take pleasure in reproducing the article in full:

"My first letter appeared in "Flight" as far back as August, 1911, and gave a description of my first glider. From start to finish it was nothing but a lump of bad luck. Encouragement and local interest was at the time anything but brisk, and not having suitable grounds I decided to take it to pieces and go back to experimenting with models. It was not very long after having come to this decision that I came across a very suitable ground for gliding experiments, and this having caused the flight fever to come on again, I was quite unable to resist the desire to build another, this time a machine of similar dimensions but with constructional details much improved, and so made as to be easily assembled or taken to pieces, strong and yet light.

"Work went on but very slowly, as I built the machine entirely myself. When finished the space occupied was 21 ft. by 6.5 ft., but it was a long time to rig up the machine. Fortunately, however, I was not handicapped for room, so that the tail and outriggers were put together as one, and the cellule braced with the extensions down. On arriving at the flying ground very little had to be done, except putting up the extensions and bolting on the tail outriggers, which are shown.

"The gliding ground was at a distance of 6 miles from the building shed, and the transportation of the machine was undertaken quite on a military basis, the axle and wheels were half turned round on the skids, the tail slung on the extension, and the machine pushed off at top speed. The time the very early morning. We arrived at our destination feeling a little knocked up. The crew with me, which numbered six, worked as happy as if at an aviation meeting, all setting to and helping me to get the machine ready. I had decided from my experience with No. 1 that it would be better to get into the seat rather than risk her on her own. Having done so, a really delightful trip took place, at a height of about 5 ft. only from the ground, being pulled quite 50 yards; the wheels making it possible to get up speed quickly, and acting admirably in every way.

"These towed flights were the most successful, free glides being limited; we never seemed to get sufficiently high to accomplish long free glides, the longest free flight being about 130 ft., but much longer towed flights were made.

"I account for this by reason of the insufficient slope of the ground and the small supporting area, which works out at 1 lb. per sq. ft., which is too heavy. I should strongly advise builders to have a loading only of ¾ lb. sq. ft. rather than a smaller area and consequently heavier loading. It is much better as a test of your manipulatory skill, and avoids also landing at a speed and with a bump that the above machine did. Above all, be most particular with respect to the wind speed.

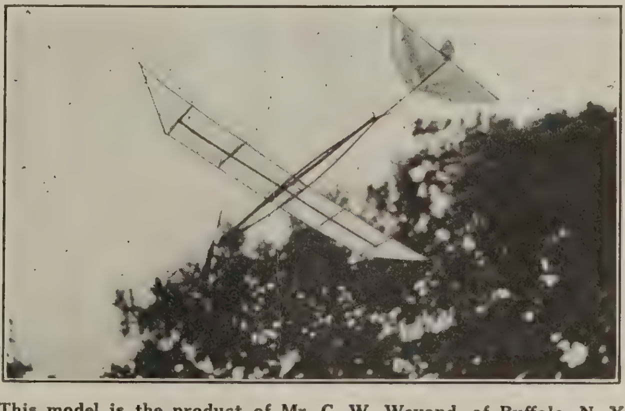
"One particular morning that we shall never forget, we motor cycled over to the ricksheds (the hangar) and found the wind much too high, but the sound of my 'Rudge multi' engine must have woke up some of the people in the neighborhood, who knew quite well that the glider was there, and they must have thought that I had got an aero motor for the machine, for they came simply like a swarm of bees.

"The wind was still too strong, and the people got so very tired of waiting, and not wanting them to lose interest, I decided something should be done. To try a solo flight was madness, so I looked round for a passenger. The machine was wheeled from the shed into the open field, each of the crew at his proper place, a friend of mine (small in build, of course) volunteered to take the place as passenger. This we thought (if anything should be really accomplished) would be quite sensational.

"Before giving and explaining the result, it would be as well perhaps to mention that the angle of the tail plane was very high, thus throwing the centre of pressure further aft and making my position not so dangerous as if placed too far forward (H. Farman fashion); at the same time, this was upsetting theory, as there was no longitudinal dihedral making it safe for myself from a landing point, but stability was so far sacrificed. William Westwood was my passenger, and we sat *very* close together: the crew pulled the machine and off we went, still remaining on the ground, when all of a sudden up we popped and down we came, a most terrible bump, I pushing the passenger off the back, after crawling from under the wreckage; poor Billy was limping, he had cut his leg, so we took him to see the doctor, where a few stitches were inserted. After the doctor had patched up and made good we returned to the glider, and to my surprise the most important part, the four main spars, had broken through after my passenger and I had come through the top plane, and seeing that the *cabanes,* extensions and *ailerons* were smashed as well, I thought the best thing to do was to start afresh rather than patch up.

"As a result of the foregoing experience I strongly advise those who are thinking of building a glider to use bamboo for their spars, outriggers and ribs, as it will bend when receiving a shock, and will not break at that. Built on this principle, and strongly braced with 16 g. piano wire, with a strainer to each diagonal, and to employ 300 sq. ft. of supporting surface, and to experiment in a reasonable wind and slope. [A loading of ¾ lb. per sq. ft. requires a wind of about 20 m.p.h. to soar.

"No doubt readers will not admire the tail outriggers, but I found it answered well, as it is the only tail out of four that I have not smashed; it was also very rigid. The outriggers themselves are sawn down 6 ins., the plate let in pegged and bound with string. The outrigger is continued to the tail strut, where a skid is fitted. The aluminum strut sockets and brackets for *cellule* bracing are bolted to the main spars. The elevating control, consists of a universal joint, wood handle bar bolted to 1¼ in. solid drawn steel tube."



This model is the product of Mr. C. W. Weyand, of Buffalo, N. Y. In a recent test the model rose from the ground and flew over 450 feet at an approximate height of 100 feet. For a tractor not measuring over 14", this is a rather good flight

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Student Aviator's Night Before Exam

By James C. Gibson

Once I tho't an aeronaut had naught to do but fly, that sometimes he would drop a bomb and sometimes he would die. I never knew he had to learn each blooming scientific term and appelations technical for every twist and squirm. But, Gee, thru A and B and C and so on to the last the names and parts and stops and starts come shooting thick and fast.

I dream of water jackets now and cooling fins and bores, I study intake valve with the pressure of my snores, I pore o'er head resistance 'till my head cannot resist it, the obturator ring is ringing and I do not dare to twist it. I often wake with concave head from dreaming planet gears—air cool my cheeks to get the churning motion from my ears.

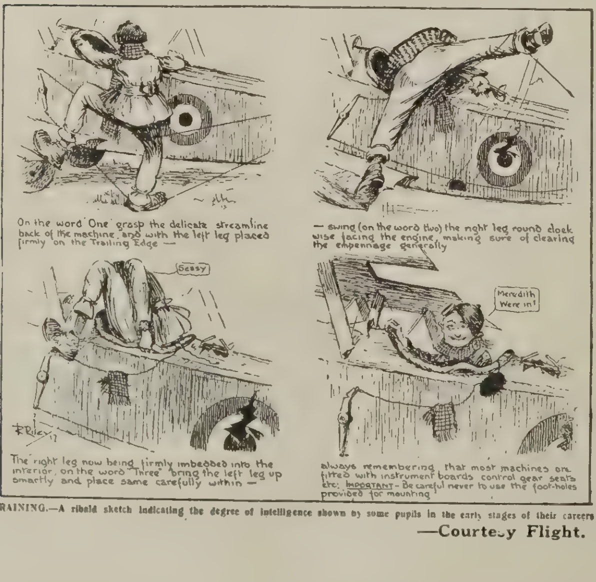
I walk for days within a maze of bases, stems and guides, of journals, chords and axes—and a thousand more besides. I eat full loads and wings and ribs, a spade grip on my knife, feed mechanism (mouth and arm) is ready for the strife and yet it is but little joy, for everything I lift brings back to mind the dope or drag, the decalage or drift.

In vain I try to stagger through; I side slip and I skid, and if I stall, a sweep-back comes, and down will go the lid. Oh, landing gear and magazine; oh, butt and stock and rod, you'll drive me to a dippy house or under-neath the sod. A violent death at Teuton hands would cause me no alarm—'twould mean a rest from yaw and throw and web and rocker arm.

Now, I am not an aeronaut, perhaps I'll never be one, but when by heart I've learned each part, I never want to see one. I joined to fight the Kaiser and go hunting for the Hun, but 'fore I learn each "technic" terms, the fighting will be done.

L'Envoi

Those blooming terms, I meet with them,
I sleep with them and eat with them;
I drink with them and think with them,
My eyes in sorrow blink with them.
I walk with them and talk with them,
My head just seems to rock with them.
They're here and there and everywhere
To cause me consternation—
And yet one never shows its face
When I am gazing into space
During examination.


On the word One grasp the delicate streamline back of the machine and with the left leg placed firmly on the Trailing Edge —
— swing (on the word two) the right leg round clock wise facing the engine, making sure of clearing the empennage generally
Seesy
Meredith Were in!
R Riley 17
The right leg now being firmly imbedded into the interior, on the word "Three" bring the left leg up smartly and place same carefully within —
always remembering that most machines are fitted with instrument boards control gear seats etc: IMPORTANT - Be careful never to use the foot-holes provided for mounting

TRAINING.—A ribald sketch indicating the degree of intelligence shown by some pupils in the early stages of their careers

—Courtesy Flight.

The Blood-Stained Spanner or the Missing Mechanic

By A. G. S. Axol

[Editorial Note.—With this week's issue of Aerial Age *we start and finish a grand new thrilling serial by that young and brilliant author of "Flight," whose sundry articles have been appearing in fortnightly parts for some time past.—*Ed.]

SAVE for the howling of the gale that raged without, and the regular beat of Captain (R.F.C.) Gaston Camouflage's heavy tread as he paced up and down the parky flooring of Lady Ima Chauviere's magnificent reception hall, and the irritatingly incessant tick-tock, tick-tock of Ima's Grandfather's clock, not a sound broke the deathly stillness of the night. It had just struck eleven. Would she fail him at the eleventh hour? Surely he had not done wrong in trusting her with the details of his secret mission, upon which so much depended? She would not, could not—Heavens!!—tell Count Kamerad! But no, he dismissed the thought almost before it crossed his mind, as a silvery laugh—hers—caused a deep flush to mount his handsome features at 3,000 ft. per minute. Again that laugh, somewhat high in pitch, and then she burst into the room.

"Ima."

"Gassy."

For a moment he stood transfixed, gazing into her liquid French walnut eyes. Her design was indeed superb. She was some 5 ft. ins. overall length, faultlessly streamlined, and her features were exquisitely carved, especially the entering edge of her chin. Her deeply cambered eyebrows and the negative washout to the corners of her mouth gave a dernière touche to her bewitching features. Her fuselage was covered with the finest quality fabric, supported thereon by expensively-jewelled bracing, and dyed with one of Messrs. Curate's world-famous art colours—a very fast cabbage pink. She had a stately and well-sprung under-carriage, that, as she taxied across the hall, produced a peculiar but none-the-less fascinating oscillation laterally. In her hair, which lay in disturbing eddies upon her head, she wore the famous Gotha diamonds set in a solid gold cabane—a wedding gift from Baron Emile Lyte de Titanine. Such were the goods that dumped themselves before his picture-orbits. (Oh, Henery! Ed.) Unable to restrain himself he threw himself at her feet.

"My love, at last," cried Gaston. "Quick, have you sealed the box I entrusted to your care? You must give it to me at once. In the courtyard below I have a special speedy scout in readiness, the Royal Aircraft Factory's latest combination of all the World's aircraft. Ah! my dear, you have no idea what a wonderful 'bus it is, nothing can touch it—even my trustworthy mechanic, A. M. Doaper, is not allowed to. It has a variable speed-range, and the weight has been cut down to a minimum, thus considerably reducing the centre of gravity. It is provided with an automatic wind-tunnel, which assures that the altimeter and air-speed indicator always show a constant reading, so that they are thus unnecessary impedimenta and are therefore eliminated from the machine's equipment.

"When taxying on the ground," shrieked Gaston, his eyes shining like Verey lights with enthusiasm, "the wheels are connected by bevel gearing to the engine, so that they keep the latter going, a six-and-a-half bladed fan, driven by the slip stream from the wood-screw in front, function to the same end when the machine is in the air."

"Oh, Gaston," cried Ima in an awful whisper, "how wonderful! And does it really fly?"

But Gaston did not reply. He was thinking of his mother's cottage with the roses round the door.

"Yes," he mused, 50 per cent aloud, 5 per cent to her, and 45 per cent to himself, "everything is in favor of a successful journey—— But come," he said, suddenly reviving up, "I have not a moment to lose, but must leave for the front by the back way immediately. I have tarried too long already, for this is Monday, to-morrow will be Tuesday, the next day Wednesday—half the week gone, and still I have not delivered that precious box to the Mess at the Air Board. How can they do without it? Ah! my love, to think that only you and I know the contents of that box—half a pound of sugar!"

(To be continued—perhaps)

The A. S. HEINRICH CORPORATION

Manufacturers of

AIRPLANES and SEAPLANES

For Military and Sporting Purposes

FACTORY

Freeport, Long Island, New York

(*Continued from page* 150)

of the goggle, but it will be remembered that his report of November 30th refers to the Army Regulation goggle, designed by and made under instructions of Signal Corps, Equipment Division, for which Strauss & Buegeleisen are not in the least responsible although they made the goggle. As soon after the Government Signal Corps order allowed them to do so, they designed and perfected a new shape goggle which overcomes all of the mechanical objections, always apparent in the original Army Standard type. This new goggle has had a marvelous sale and is in almost universal use today.

"How little it interferes with vision is testified to not only by the Bureau of Standard's report now issued, but as well by the continued and satisfactory experience of thousands of aviators.

"That it is nonshatterable and therefore provides safety is evidenced by the fact that literally hundreds of eyes have been saved by its use. In every camp, there are many instances where the use of Resistal has been a real factor for safety.

"It is curious to note that in Day's report a comparison is made of the price charged to the Government on the old style goggle and the price charged to the aviator for the new style. For all the faults that are attributed to the old style goggle, distortion of vision, etc., is due to the fact that the Signal Corps would not pay more than to enable the manufacturer to produce a better goggle, optically speaking.

"It naturally follows, therefore, that the best goggle was furnished by the price the Signal Corps paid, but with the aviator appreciating more the necessity for proper protection, he has been willing to pay and has been anxious to pay a better price to get the proper article than the Government supplied and that is the reason the new style had a little higher price, against which none of the complaints or arguments can be brought.

"It is unfortunate that the large amount of work the Signal Corps had to do in its various departments should have prevented up to now, proper investigation of this matter. That any action in March should be based on a report of November and without knowledge or information as to what has happened since November, in the development of goggles, is indeed unfortunate. The aviator, however, and the commanders of the fields have been closer in touch with the situation. They know the more recent developments and by reason of the simplicity of the organizations at the field they are in a better position to handle this entire subject and will undoubtedly do so.

"Copies of the complete Bureau of Standard's report may be had of Strauss & Buegeleisen who have prepared duplicates for distribution."

Personal Paragraphs

Among the ninety-eight men who received diplomas from the army aviation school at Ohio State University here recently were Russell G. Colt, husband of Ethel Barrymore, the actress, and Philip D. Armour, 3d.

The latter is a nephew of J. Ogden Armour.

Lieut. Joseph Stehlin, winner of the French War Cross and two citations for bravery, and one of the aerial "aces" of the famous Lafayette Escadrille, was injured slightly when he lost control of an aeroplane in which he was flying over the Sheepshead Bay Speedway last week, and was thrown out of the plane, when it was wrecked by digging its nose into the speedway turf. Lieut. Stehlin is only 20 years old and one of the youngest of the French airmen.

Mrs. John T. Woodruff of New York City announces the engagement of her daughter, Miss Anna Louise Woodruff, to Lieut. William Parker Taylor, son of Mr. and Mrs. William O. Taylor of Plainfield, N. J.

Lieut. Taylor is attached to the 183rd Aero Squadron and is now stationed at Garden City. He expects to start for France in a few days.

Two army aviators from Mineola flew over New York in the interest of the War Saving Stamp campaign. During their flight over the city they dropped papers urging the public to buy War Saving Stamps, and also calling for recruits for the Twenty-seventh Division, which is at Spartanburg, S. C. Lieut. Roy E. Ludick and pilot, Henry S. Smith landed on the Sheep Meadow in Central Park. Then while the crowd hurred to the centre of the field to examine the machines, four women members of the National War Savings Stamp Committee sold $3,000 in War Savings and Thrift Stamps. The sellers were the Misses Una Maher, Anna Finerty, Rita Mooney, Mabel Sievers and Mrs. P. O. Altman.

Activities At Long Island School

The Horace Keane School of Flight, at Central Park, Long Island, is becoming the center of attraction for numerous interested spectators in the vicinity of New York. The field is easily reached by automobile and, on week ends especially, it is common to see thirty or more cars lined along the roadway while the occupants cluster around the machines between flights.

The school has a number of pupils who are making flights daily, most of them making rapid progress in the art of flying under the training of Dean I. Lamb, Flying Instructor of the Horace Keane School. Mr. Lamb reported one pupil who has been aloft only ninty minutes and is ready to make landings alone. The pupils are enthusiastic about their work and the manner in which the school is conducted tends to promote rapid progress in handling a military aeroplane.

On Sunday, March 24th, among the passengers carried at the School were Craighton Hale of moving-picture fame, who is a member of the Aero Club, and George F. McLaughlin of AERIAL AGE, who, with some preliminary instructions from Mr. Lamb, took the controls when an altitude of 4,000 feet was reached, circling above the field for about twenty minutes.

S. B. Riley Returns to England

Mr. S. B. Riley, general manager of the extensive Manchester (England) plants of A. V. Roe & Co., Ltd., designers and builders of the Standard Avro training biplanes—recently demonstrated by Lieut. Colonel Charles F. Lee, R. F. C., with startling effect over Washington—and the various Avro types of battleplanes, has returned to resume his arduous war duties after a month's sojourn in the United States.

During his stay Mr. Riley visited the principal aircraft instruction concerns here, and to a representative of AERIAL AGE he spoke most appreciatively of the courtesies extended him by various Washington aeronautic officials and the management of the plants he visited.

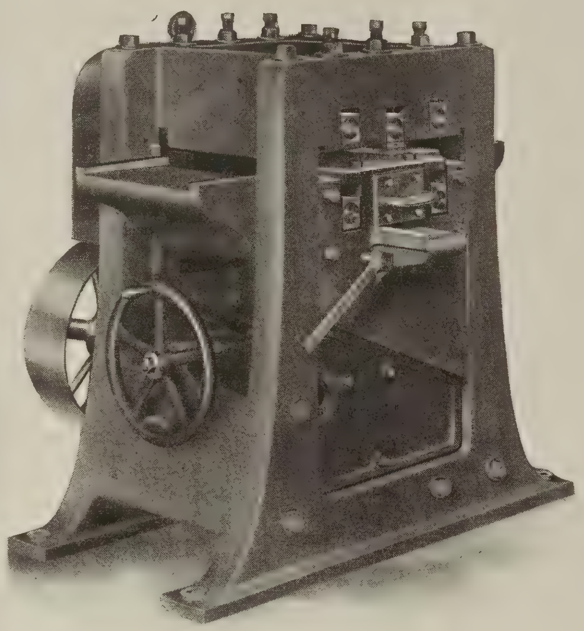
Though but a young man in years Mr. Riley has evidently achieved an enviable reputation as a capacity producer of the "Standard Avro," which has been exclusively adopted by the British Air Board. In the production of this machine there are now seventeen of the principal British aircraft manufacturing firms—in addition to Messrs. Roe's own extensive plants—engaged in meeting the Government's demand for enormous quantities.

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY

Toothing Machine



Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog
and samples [illegible]

Baxter D. Whitney & Son
WINCHENDON MASSACHUSETTS

(*Continued from page* 154)

Trottear, Daniel K.	SLR
Taylor, James Reddington	Note 5; CPR
Templeton, Raymond Everett	SLR; EOT
Tolbert, Benjamin Harrison	DIK
Taylor, Henry Harrison	SLR; GLC
Thompson, Bernard S.	FRF
Tooke, Roscoe C.	KST
Thayer, Alexander D.	SLR; EOT
Tompkins, John L.	SLR
Turner, Earle O.	SLR; EOT
Teigen, Carl Peter	SLR; GLC
Taft, George	SLR
Thayer, Lucien H.	SLR; WFO
Tilden, George A.	SLR
Tanner, Herbert J.	DIK
Turner, Earle Oliver	SLR; PMT
Timpson, Louis G. M.	FRF
Taft, George Henry	SLR; BST

U

Uppington, Claud D.	PFO
Urion, Alfred Riley, Jr.	SLR; TFT
Underwood, Ralph W.	SLR; WFO
Underill, Charles R.	FRF

V

Vogel, Karl C.	FRF
Von Kokeritz, Carl John	SLR; GLC
Valentine, Herman William	SLR; AAD
Verbeck, Howard G.	Note 17
Valentine, Melvin S.	SLR; WFO
Van Devanter, Isaac Burnans	SLR; CSO
Vogel, Karl C.	SLR
Vohr, John Henry	SLR; GLC
Vieh, Walter F.	REL; TMA

W

Waterman, Sherwood L.	FRF
White, E. G.	FRF
Whitehead, Cecil F.	LHV
Williams, Spencer C.	FRF
Woolley, Roy	FRF
Wright, Elijah F., Jr.	FRF
Withington, Leonard	SLR; TFT
Wagner, Ned Follmer	SLR; GLC
Wilson, William Carroll	SLR; GLC
Weir, Benjamin G.	LHV
Watt, Howard R.	SLR
Weigler, William R.	SLR
Whelan, Sidney S.	SLR
Wortham, Gus S.	SLR
Wright, George S.	SLR
Woodman, Cony U.	FRF
Whitworth, William S.	SLR; CRI
Wade, Herbert Clarence	SLR; EOT
Whitney, Courtney	SLR
Whitney, Joseph L.	FRF
Wohler, Chester B.	DIK
Walker, Howe	DIK
Wasson, Roy J.	PFO
Wells, Roe E.	PFO
Ward, Joseph E.	SLR
Whinery, John E.	SLR
Wiehe, Trude A.	SLR
Wilcox, Leon B.	SLR
Wolf, Ninian L.	SLR
Ward, Eugene B.	SLR
Watters, John	SLR
Woodleton, Royal B.	SLR
Wackenhuth, Charles Reinhart, Jr.	Note 10
White, Roderick I.	SLR
Wing, Claude E.	SLR
Woeltjen, Herman W.	DIK
Whinery, John Enloe	SLR; TMA
Wolf, Ninian Livingston	SLR; GLC
Whelan, Sidney Smith	SLR; PMT
Wickard, F. Rosier	Note 24
White, John Robert	CSO
Williams, Sanford E.	SLR; PFO
Wiehe, Trude Alfred	SLR; PFO
Wright, Putney L.	PFO
Weigler, William Reed	SLR; WFO
Wright, George Swinford	SLR; WFO
Wortham, Gus Sessions	SLR; WFO
Watt, Howard Reifsnyder	SLR; CSO
Whitney, Courney	SLR; GLC
Wilcox, Leon Bowman	SLR; SBI
Ward, Joseph Emory	SLR; WFO

Z

Ziegler, Clarence C.	SLR; WFO
Zapp, Julian E.	FRF

J-M Branch in Tacoma

Tacoma has "arrived" as a world port—and Johns-Manville Service, the Service that "covers the continent," is there.

Tacoma's port business has increased 300 per cent over 1913—the highest pre-war total—with a higher figure expected because of its natural shipping facilities, its connection with the Far East trade and the C. M. & St. P. railroad's agreement with the Japanese lines. To these commercial advantages have been added six huge shipbuilding plants, turning out both wooden and steel ships.

For the better service of the shipbuilding and allied interests, as well as the constantly increasing number of manufacturing plants, the H. W. Johns-Manville Company have opened a new branch office at 1015 A Street, Tacoma. Here is carried a complete stock of asbestos packings, moulded and in sheet form, and other well-known Johns-Manville Power Plant Specialties. The advantage of a complete stock at hand lies not only in the aid it affords to a proper selection, but in the prompt deliveries which can be made—a point of service greatly appreciated by packing users.

Tacoma industries thus are assured the same service that every other large city enjoys—another example of the Johns-Manville Service which "covers the continent."

American Fliers Win Praise From French

An appreciation of American aviators in France was received by the press in an official French dispatch, quoting the "Petit Parisien" as follows:

"Our American allies, who are beginning to reinforce our numbers, are already proving their value. They are sportsmen and show much interest in athletic exercises in the training of pilots.

"Among them let us cite the holder of a world's record for running, Ted Meredith, who is finishing his instruction somewhere in France. The famous football and hockey player, Hobey Baker, is already on the front and has two victories to his credit. Sergeant Putnam has been longer at work. He achieved his first success the fifteenth of January, the second the twenty-seventh of January, and his third the fifteenth of March.

"We can have confidence in the aid brought by the American pilots. Before long 2,000 of them, perfectly trained, will take their place in the ranks of our Allied army."

Garabed Giragossian to Pick Five Experts to Test His Invention

Secretary of the Interior Lane is waiting for Garabed T. K. Giragossian to name a committee of five scientists to witness the tests of and to report on the "Garabed," the free energy invention of Giragossion.

Much is claimed for this invention, and an Act of Congress was passed for its secret test. It was provided that a committee of five scientists was to be selected for the purpose to be acceptable to the Secretary and the inventor.

Giragossian submitted more than twenty names to the Secretary. Of this number the Secretary promptly selected ten. From this number five are to be selected by Giragossion.

The names of none of the men will be made public, however, until the tests are completed.

It is claimed by the inventor that this device will take free energy from the air and convert it into unlimited power for all purposes.

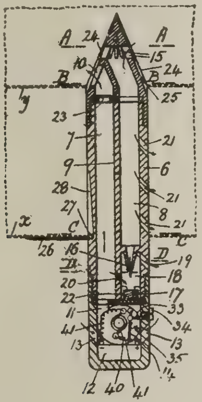
RECENT AERO PATENTS

BY WILLIAM N. MOORE

Curtiss Granted Flying Boat Patent

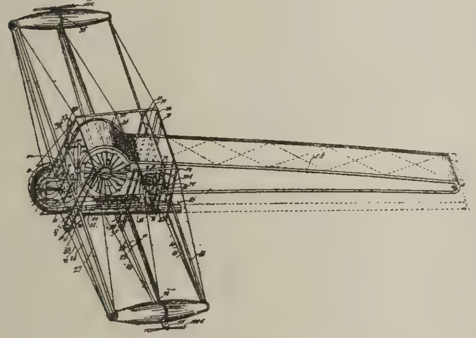
The United States Patent Office granted on February 19, 1918, the claims made in an application filed on December 11, 1914, by Glenn H. Curtiss, the well-known aeroplane constructor of Hammondsport, on behalf of a patent covering the construction of stepped and V-bottomed flying boat hulls. We shall reprint the claim in full next week.

1,139,354. PROJECTILE FOR DESTROYING AIRSHIPS, BALLOONS, AND OTHER AEROSTATS. Reginald Arthur Featherstone-Smith and Meherjibhoy Bomanji Cooper, London England. Filed Sept. 19, 1914. Serial No. 862,501. (Cl. 102—26.)



1. A projectile for destroying airships and the like comprising a shell having an air passage extending therethrough toward the nose end and a gas passage extending therethrough toward the tail end, a gas igniter in communication with the gas passage, openable stops at the exterior of the shell, and an air blower in communication with the air passage.

1,151,419. SPEED-CONTROLLER FOR AEROPLANES. Alexander Blair Thaw, Pittsburgh, Pa. Filed Jan. 29, 1914. Serial No. 815,207. (Cl. 244—29.)



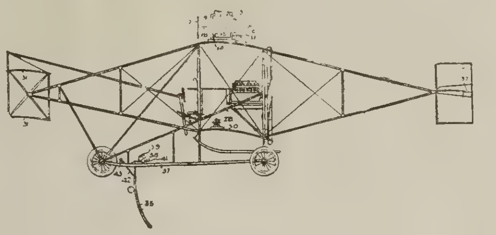
1. A controller is characterized, comprising a yielding air-pressed plane; operating mechanism for the balancing members of an aeroplane; a plurality of electro-mechanical devices for selectively actuating said operating mechanism; a plurality of electric circuits, each embodying one of said devices; a plurality of electric switch members controlling said circuits, one of said switch members being connected with said yielding plane; and a controlling switch for said electro-mechanical devices embodying a movable contact member disposed to be engaged by the ground when landing said aeroplane.

2. A controller as characterized, comprising a yielding air-pressed plane; operating mechanism for the balancing members of an aeroplane; a plurality of electro-mechanical devices for selectively actuating said operating mechanism; a plurality of electric circuits, each embodying one of said devices; a plurality of electric switch members controlling said circuits, one of said switch members being connected with said yielding plane; a controlling switch for all the circuits of said electro-mechanical devices; and an antenna operatively disposed in advance of an aeroplane to engage a supporting medium preliminary to making a landing thereon.

3. A controller as characterized, comprising a yielding air-pressed plane; operating mechanism for the balancing members of an aeroplane; a plurality of electro-mechanical devices for selectively actuating said operating mechanism; a plurality of electric circuits, each embodying one of said devices; a plurality of electric switch members controlling said circuits, one of said switch members being connected with said yielding plane; a controlling switch for all the circuits of said electro-mechanical devices, an antenna operatively disposed in advance of an aeroplane to engage a supporting medium preliminary to making a landing thereon; and means for holding said antenna in out of service position after being moved by contact with said supporting medium.

4. A controller as characterized, comprising a diving plane; automatic means for operating said diving plane; and means for discontinuing the operation of said automatic means, said last-mentioned means embodying a member for engaging the ground when the body of the aeroplane is approaching the same.

1,141,431. FLYING MACHINE. Frank Steinmann, St. Louis, Mo. Filed July 1, 1912. Serial No. 707,124. (Cl. 244—14.)

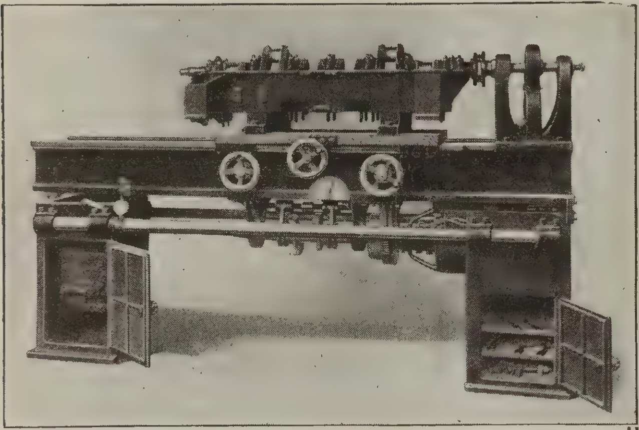


1. In a flying machine, in combination with main sustaining planes, a compressed air actuated tiltable stabilizing propeller located at the extreme outer end of each sustaining plane, and operatively connected to a plurality of air tanks extending longitudinally of the machine and forming, in conjunction with the sustaining planes a base for the machine and also a means for keeping it afloat when alighting on water, means for propelling the machine along a launching rail consisting of a frame attached to the lower part of the base and provided with bearings in which are journaled a drive wheel and a rear landing wheel respectively, a roller grip safety attachment on said frame for guiding the machine along the launching rail and adapted to be disengaged therefrom when an ascending flight is to be made, and lateral cables to balance the machine when it is not in motion.

2. In a flying machine, in combination with sustaining planes, a compressed air actuated tiltable stabilizing propeller located on the end of each sustaining plane, means under the control of the operator for driving the same and setting the same at different angles, a plurality of compressed air tanks running longitudinally of the machine and forming, in conjunction with the sustaining planes, a base for the machine and also a means for keeping it afloat when alighting on water, a frame provided with bearings attached to the underside of the base, a driving wheel journaled in said bearings and adapted to engage with the launching rail, a chain and sprocket drive for rotating the driving wheel, lateral balancing wheels, and a roller safety grip for guiding the machine along the rail and capable of being disengaged therefrom when an ascending flight is to be made.

3. In a flying machine, in combination with sustaining planes a compressed air actuated tiltable stabilizing propeller mounted on the end of each sustaining plane, a pivoted stabilizing plane in the form of a casing consisting of a canvas covered truss frame of slotted pipes extending longitudinally of the machine, means for setting the stabilizing plane to any angle at the will of the operator, comprising a hand wheel, air tanks adapted to act as floats, a wheel frame extending longitudinally of the machine, and a drive wheel and a rear wheel mounted thereon and adapted to engage with a rail, driving means for the drive wheel, and a launching roller grip operated by rods and cams under the control of the operator.

4. In a flying machine, in combination with a sustaining plane, an elevation plane mounted on trunnions supported by suitable standards secured to compressed air tanks constituting a floating body to sustain the machine on water, connecting means extending between said trunnions and forming a housing for a power plant comprising an air compressor and suitable motors, said elevation plane comprising a truss frame of endless slotted pipes extending longitudinally of the machine and parallel to the direction of flight, said truss frame being formed with a large circular front end and tapering to a small circular rear end; means for covering said truss frame, consisting of canvas, balls of suitable material sewed into said canvas at suitable intervals along its sides and adapted to be inserted into the slotted pipes, a shaft passing transversely through the circular front end of the truss frame and suitably supported therein, wind wheels mounted on the ends of said shaft, means for elevating said elevation plane and said wind wheels, main propellers mounted on said elevation plane and driven by suitable gearing actuated from the power planes, and suitable means to drive the air compressor from the wind wheel shaft.



This machine accurately locates, measures and indicates on the dial in ounce-inches the correction needed to produce true running balance. Shafts can be balanced in crank cases or separately.

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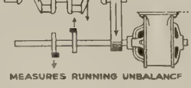

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AERIAL AGE
WEEKLY

Vol. 7, No. 4 APRIL 8, 1918 10 CENTS A COPY

(French Official Photo)

General Maistre, Commander of the Sixth French Army, inspecting an aviation camp in the Aisne district.

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A. S. Burleson, Postmaster-General

Inner Problems of Aircraft Situation Made Public and Steps Proposed for Solution

Hispano-Suiza Engine

The ABILITY to DO

AT a time when the manufacture of airplanes and engines is of such international prominence as at present, it is important to note the expansion of the Wright-Martin Aircraft Corporation under the leadership of men of known ability.

For the manufacture of the famous Hispano-Suiza engine for all types of airplanes, the character of the organization is noteworthy, supported as it is by the origination of the basic aviation patents.

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VOL. VII NEW YORK, APRIL 8, 1918 No. 4

INNER PROBLEMS OF AIRCRAFT SITUATION MADE PUBLIC AND STEPS PROPOSED FOR SOLUTION

Aero Club of America Protests Against Halting Aviation Section Enlistments

IN a letter sent to President Wilson, Mr. Alan R. Hawley, the President of the Aero Club of America, brings to the President's attention the fact that the Signal Corps is refusing further enlistments for the Air Service, although only one-sixth of the necessary aviators are under training. Mr. Hawley also gives the main inside causes of the present delay in the Aircraft Program, and points out that we are making today another mistake even more serious than the mistake of six months ago, which led to the present delay in aircraft production. Mr. Hawley also points to the steps that should be taken immediately to correct the past mistakes and insure against a costly failure to supply the air forces needed by the Allies to win the war.

Mr. Hawley's letter to President Wilson follows:

"My dear Mr. President:

"A number of men who had applied for admission in the Air Service of the Army have advised the Aero Club of America that they have been notified by the Signal Corps authorities that no further enlistments are being accepted at this time.

"As Secretary Baker's report, published recently, stated there were less than four thousand aviators under training, and knowing that it will take twenty thousand aviators to keep five thousand aviators on the fighting front continuously for one year; and realizing that to lack the trained aviators to supply the necessary replacements would mean defeat for the cause of the Allies, we were amazed to find this condition.

"In answer to our inquiries, we were advised that the reason no further enlistments are accepted for the Air Service is that there is a lack of training fields and of aeronautic equipment and that these cannot be provided because there are no funds available for the extension of the Air Service.

"This is only one of the evidences that the aircraft program is slowing down because of lack of funds. We have been advised by factories that have completed their orders that they also do not have orders to look forward to and to prepare for.

"We submit, Mr. President, that this is a mournful condition which threatens the cause of the Allies more seriously than anything else. Supremacy in the air is to be the key to victory. To achieve and maintain supremacy in the air, the Allies must have the support of the United States. The Allies must be able to count on not less than twenty-five thousand American aviators, so as to insure keeping five thousand at the front continuously for the various duties of the Air Service and for the bombing expeditions.

"The percentage of replacements needed in the Air Service has increased greatly in the past six months and will further increase in the coming year, because there is much more aerial fighting, attacking troops from the air, bombing at low altitudes and night raiding. Aerial fighting is becoming more and more intense; and the anti-aircraft guns are firing more and more accurately and hitting aeroplanes at altitudes of sixteen thousand feet. This increases the casualties among aviators enormously.

"This condition today is analogous to the condition which existed last October in the American aircraft situation as a whole. A large number of training camps had been established, at a cost of $390,000,000, orders for aeroplanes and motors had been placed, and the funds had practically been exhausted. Thereupon the work of developing additional sources of supplies for aircraft and motors practically stopped, notwithstanding the fact that the Italian reverses and the Russian collapse demanded imperatively that our program be tripled in size.

"The Aero Club of America officials urged and pleaded for prompt consideration of this new condition at the time, and pointed out that it was absolutely necessary to immediately give two billion dollars additional appropriations for extending the aircraft program. That was six months ago, when prompt action would have prevented the confusion and mistakes which were subsequently made, partly owing to lack of sufficient appropriations.

"The main cause of the present deplorable condition of our aircraft program was that the authorities in charge tried to make twenty thousand aeroplanes do the work of eighty thousand. The original program did not take into consideration that it takes an average of two aeroplanes to give an aviator the one hundred hours of preliminary and advanced training needed to make him fit for the present-day highly specialized work of a military aviator. Nor did it take into consideration that it takes close to one hundred per cent. replacements per month in aeroplanes and motors to keep aviators equipped for fighting. Nor did it take into consideration that it takes forty per cent, replacements in aviators per month to keep up the fighting personnel of aero squadrons.

"In making this program the fact was overloked that if the plan was to keep five thousand American aviators at the front, it was necessary to train twenty-five thousand. Therefore, there would be required fifty thousand preliminary and advanced training aeroplanes with which to train them speedily. The number of aeroplanes under construction today is not sufficient to even give the preliminary and advanced training to the number of aviators the United States must supply within the coming twelve months.

"There was also overlooked the fact that to keep five thou-

AERIAL AGE WEEKLY HAS BEEN ADMITTED TO FULL MEMBERSHIP IN THE AUDIT BUREAU OF CIRCULATIONS—COPIES OF REPORT WILL BE MAILED TO ADVERTISERS ON REQUEST

sand aviators equipped for action, there would be required an average of two thousand aeroplanes of different types per month, or a total of twenty-four thousand machines of different types during the twelve months.

"Having overlooked these very important considerations, the authorities could not undertake to supply all the aeroplanes needed out of the twenty-two thousand planned. The Italian and Russian reverses created imperative needs, and the authorities received cables requesting thousands of aeroplanes of different types. Lacking the funds necessary to place additional orders, the authorities changed the orders which they placed, so as to meet the requests from France. As the requests from France and the suggestions from the different Allies were for different types of machines, the authorities kept on changing the orders, so as to supply those machines for which there seemed to be the most pressing need. This led to the continuous changes which caused the setbacks which have resulted in the aircraft program—which is still the same program made at the time when Italy was victorious and Russia was still fighting—being behind by several months.

"Had the authorities been in a position to place additional orders whenever they received cables asking for a given number of machines of a given type, instead of having to change orders for machines under construction, today the original program would be nearly delivered and an additional program would be well under way.

"Today we are making the same mistake that was made then. We are stopping the enlisting of aviators and no steps have been taken to extend the program to meet the new conditions which have arisen, and which, unless they are met promptly, may result in Allied reverses and public condemnation of your Administration, not only from the American public, but also from the Allies.

"It is tragic to us, Mr. President, to know that while aeroplanes and aviators are needed so badly to fight this fight for civilization and humanity, hundreds of manufacturers who could be making aeroplanes and motor parts are kept in forced idleness for lacking of orders, and thousands of patriotic young men who are anxious to join the Air Service and go to France and do their share towards winning the war, are told that no further men are being taken in the Air Service.

"The delay in producing the Liberty motor cannot be held responsible for not giving preliminary and advanced training to aviators. This training, which includes cross-country flying, bomb-dropping, shooting at moving targets from aeroplanes, could be given with existing types of machines and motors.

"We submit, Mr. President, that action must be taken promptly.

"We agree with the members of Congress who advise us that those in charge of the present aircraft program have failed to make good and that it is hardly possible to expect better from the same organization if conducted by the same authorities on the present plan of action.

"We have followed the aircraft program step by step and are familiar with the inside problems that have caused the delays. These causes are numerous, but the main ones are:

"(1) Lack of concentrated responsibility, authority and control in the management of aerial matters.

"(2) Lack of sufficient appropriations to extend the aircraft program to meet the military needs of the Allies.

"(3) Lack of touch between the authorities dealing with the strategic side of the war and the authorities having charge of the supplying of aircraft and aviators needed to build American and Allied air forces.

"(4) The lack of a Government department having the authority and organization necessary to deal with all aircraft matters and prevent delays due to division of responsibility, bureaucratic jealousies and official squabbles over matters of departmental jurisdiction, duplication of efforts, etc. The present Aircraft Board is only an advisory board and has no power to act or to get the necessary organization to extend or carry out an extended aircraft program.

"To correct the situation, two successive steps must be taken, as follows:

"(1) The immediate appointment of an Assistant Secretary of War and an Assistant Secretary of the Navy to represent the Army and Navy, respectively, in the Aircraft Board. This is to solve the immediate problems while the second step is being taken.

"(2) The creation of a Department of Aeronautics, based on the British plan, which places the Air Services under a separate Department of Aeronautics, the head of which is independent of, although cooperating closely with, the War and Navy Departments.

"The British Government went through every one of the troubles we have gone through in connection with our air service. The official reports of the investigation of the British Air Service in 1916 shows that there were scandals and charges, counter-charges and confusion, just as we have in the United States today. After three years of trying different plans, the military and naval authorities and other branches of the British Government came to the conclusion that the only solution was a separate Department of Aeronautics, with an Air Minister at the head, whose functions are identical with the duties of the War Minister and the First Lord of the Admiralty.

"A separate Department of Aeronautics is the only solution to all the problems of building the air forces needed to win the war.

"We must add that many of the officials in charge of the aircraft program and the members of their staffs are able men who, if placed in a Department of Aeronautics and given the power necessary to act and to get together an efficient organization and the necessary funds, will quickly save the situation and enable the United States to do its share in the air this year.

"It is well to add that an important consideration that led to the creation of the Air Ministry in Great Britain was the knowledge that Germany is planning extensive aerial mail, express and passenger transportation lines, to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of aircraft. This would give her a reserve air fleet large enough to blow England, France or Italy off the map overnight.

"As was brought out in the House of Commons by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. Any nation that overlooks this fact may pay dearly for its oversight.

"We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hopes does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids of Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, we must be ready to protect the Republic and the rights of Humanity and the Cause of Civilization. To do this will require direct control and supervision of military and commercial air fleets, and this can only be done by a well organized Department of Aeronautics.'

"In conclusion may we point out that in the past events have always proven that our suggestions, which were termed as excessive by some people at the time they were made, were most conservative. We beg you to judge these recommendations accordingly.

"Assuring you of the hearty cooperation of the Aero Club of America and its affiliated Aero Clubs and cooperating organizations, I beg to remain

Very truly yours,

(Signed) ALAN R. HAWLEY,

President, Aero Club of America.

THE NEWS OF THE WEEK

4,500 Men to Be Drafted for Aviation Service

Provost Marshal General Crowder announced that 4,509 draft registrants will be called to equip themselves to assist in the maintenance of the Air fleet. The call was made on Illinois, Minnesota, Iowa and Indiana, and men will be given a thorough training course in woodworking and gas engine operation and repair at fourteen educational institutions selected by the government throughout the country.

The voluntary induction system will be tried, but where the State fails to produce its quota, local boards will be directed to conscript enough men to fill it. It is specified that the registrant must have had a grammar school education.

. The schools and quotas which each State is directed to send follows:—

Minnesota—Three hundred men to Carnegie School of Technology, 500 to University of Cincinnati, 500 to University of Minnesota, 189 to Pennsylvania College, 320 to University of Pittsburgh.

Illinois—One hundred men to University of Chicago, 200 to Lewis Institute, Chicago; 100 to Northwestern University, Evanston, Ill.; 300 to Bradley Polytechnic Institute, Peoria, Ill.

Iowa—One hundred to New York University, 400 to University of Wisconsin; 500 to Rahe Automobile and Tractor School, Kansas City, Mo.; 500 to Sweeney Auto School, Kansas City, Mo.

Indiana—Five hundred to Purdue University, Lafayette, Ind.

Lawson Aircraft Company Expanding

According to a statement in the Milwaukee Journal, the Lawson Aircraft Company of Green Bay, Wisconsin, is about to erect a $500,000 plant in Milwaukee and will move its organization to the new plant. The reason for removal from Green Bay is that more capital can be raised in Milwaukee. The plans for the refinancing of the Lawson Company on a larger scale are already under way.

Count De Limur, Aviator, Marries Miss Ethel Crocker

Comte Andre Marie Adrian de Limur, a pilot in the French flying corps married Miss Ethel Crocker, daughter of Mrs. William H. Crocker, of New York and Burlingame, Cal. The wedding was hurried, as Comte de Limur, who has been on active duty in France, is here on only a brief leave of absence. Many distinguished and prominent members of New York society attended the wedding.

No More Untrained Aviators to be Sent to France

According to E. Percy Noel, of the New York Globe, from now on practically no pupils or pilots will be sent to France to begin or complete their training. Already one advance school, which was partially borrowed from the French, has been abandoned by the Americans. Elementary and advanced schools developed from a French nucleus or wholly created in France by the Americans will become aviation reserve depots for trained pilots.

These pilots arriving from home and also squadrons of enlisted men will have equipment and opportunity for practice so as to be tuned up to top pitch flying ability until ordered to the front. Pupils from ground schools and also military pilots have been sent to France in the past because of the lack of facility principally in the matter of aeroplanes and instructors for their training at home. Until the latest types of the fastest machines could be reproduced in America it was impossible to give the higher class of instruction which their pilots require.

King George Praises American Airmen

Reuter's correspondent at British headquarters in France, describing King George's trip to the front, says:—

"In the course of an inspection the King visited an aerodrome, where he inspected an American section, the members of which he congratulated upon their fine and smart appearance, praise which was well justified, for a livelier looking set of lads never yet swore to drive the Huns out of the air.

"The King spent a crowded fifty hours in France, moving about freely among troops who had taken part in the first onrush of the German offensive."

Gas Used for Testing Aero Motors

Recently the Detroit City Gas Co., an American Light and Traction Co. subsidiary, sold some $1,250,000 bonds, the proceeds to be used to finance the additional plant extensions due to the increased demand for gas in munition plants. This gas, it is learned, is being substituted for gasoline in testing aeroplane motors. So comprehensive is the aero motor building business that this new use for gas in Detroit has increased the daily demand 5,000,000 cubic feet.

Lieut. Col. Henry B. Joy, now serving in France, resigned as president of the Packard Motor Co. to give all his time to war service.

Special Aid Society Continues Its Effective Work

The Aviation Committee of the National Special Aid Society, Inc., of No. 259 Fifth avenue, which is dedicated to the work of collecting gold and silver, as well as the baser metals in the forms of trinkets, coins, &c., and disposing of them for cash, has been purchasing supplies needed by American aviators, mostly articles not yet provided by the government.

Since September the committee has raised $40,000. It has utilized this sum to purchase leather, fur lined helmets, flying coats, flying breeches, aviator mittens, boots, trench coats, goggles, sweaters, socks, blankets, mattresses and cots.

All the German coins contributed will be melted up and sold, and the receipts turned to good account for the equipment of our fliers.

With Our Boys "Over There"

Lieut. Harold T. Hambleton has brought down two German airmen, according to a letter received by his parents, Mr. and Mrs. William G. Hambleton of New York.

The bringing down of another German aeroplane has been credited to Paul F. Baer, of Fort Wayne, Ind., a member of the Lafayette Flying Squadron.

He toppled over a two-seated biplane recently. Friends claim that Baer brought down two machines on the same day. Only one of these, however, has been credited to him officially, but the other is under investigation. Baer is officially credited with two machines shot down, the other victory having been achieved last week.

Frank L. Baylies, of New Bedford, Mass., a former member of the American Field Ambulance, shot down a German machine last week.

David Putnam, of Brookline, Mass., a member of the Lafayette Escadrille, has brought down two more German aeroplanes, making a total of five, of which four are "official." He was attacked by three monoplanes. After a sharp fight he brought one down and the others fled. Later Putnam was attacked by two biplanes and brought down one of them.

Putnam was decorated with the French War Cross and promoted to be Sergeant. He has not yet obtained his transfer to the American air forces.

At the Aviation Training Fields

The first Liberty motor has arrived at the University of Illinois ground school, where it will be used for instruction purposes.

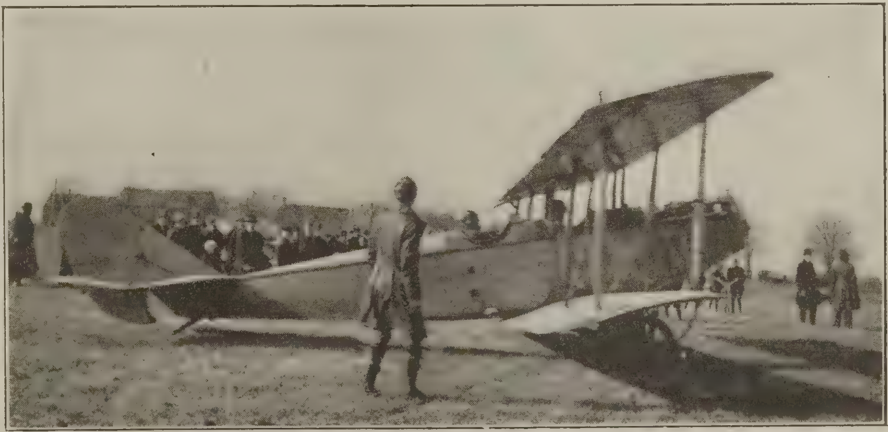
The Flying Cadets at Love Field, Texas, are now receiving instruction in cross-country flying. Landing fields have been provided for at several towns nearby.

The Navy Department made its first balloon observations of New York harbor recently, and sent several captive balloons from the decks of vessels to different altitudes. The tests began at 1 o'clock and ended at 5 o'clock.

The aeronaut who was the first to ascend suffered a mishap. When the balloon was a considerable distance up, the cable slacked and the balloon floundered in the water. The aeronaut got from under the bag and was bauled aboard his ship. The balloon was pulled in by cable.

Several other balloons went up successfully. Each balloonist carried a telescope and was connected by telegraph with the vessels. The balloonists made the observations and telegraphed the results to the ships' decks.

A half dozen big machines hovering over a Texas town no longer attract attention. Texans have come to regard the army fliers, with their dives, loops, nose spins and similar feats, as very ordinary. The frequent cross-country flights between Fort Worth, Dallas, Wichita Falls, Waco, Houston and San Antonio no longer send the barnyard flocks hurrying to cover. Even the chickens have come to look upon the aviators and their big machines as everyday visitors.



A Curtiss JN training tractor at the Horace Keane School of Flight, Central Park, L. I.

Army Appoints Board to Select Locations for Aerial Coast Patrol Sites on the Pacific

A Board has been created by the War Department for the purpose of locating aero coast defense squadron sites and balloon coast defense company sites in the South Pacific Coast Defense District, which centers at San Francisco, and for the North Pacific Coast Defense District, with headquarters at Seattle, Wash.

The members of the Board are as follows: Major Edwin B. Lyon, A. S., S. C.; Capt. Frank Stockdale, Medical Reserve Corps; First Lieut. Clarence G. Spencer, A. S., S. R. C., and Mr. C. B. Feber, A. M. E. A fifth member is to be an officer designated by the Coast Defense commander.

Aero Mail Landing Place for Philadelphia Selected

Arrangements have been made for the lease of a site for the postal service aeroplane landing field at Philadelphia, the Post Office Department announced. The land is in North Philadelphia, just outside of Bustleton on the Lincoln Highway and about twenty-five minutes from the Philadelphia post office.

Work of constructing hangars will begin at once. The field will be ready before May 15, when the aeroplane postal service between New York, Philadelphia and Washington will be in operation.

Emplacements for Anti-Aircraft Guns to be Erected in New York

Action has been taken by the War Department toward protecting New York and vicinity from possible air raids. It was learned that the War Department has awarded a contract to the White Fireproof Construction Company for the construction of two concrete anti-aircraft gun emplacements in Mount Morris Park, Fifth Avenue and 120th Street; Tompkins Square Park, Avenue A and Seventh Street; Fort Greene Park, Myrtle Avenue, Brooklyn; Lincoln Terrace Park, Greenwood Cemetery, and Mount Olivet Cemetery, Brooklyn.

The plans of the War Department call for the construction of two concrete anti-aircraft gun emplacements on each site. The work on several of these began some time ago. The bases will be large blocks about eight or ten feet square and ten feet deep. It is believed that additional emplacements will be built soon after those planned have been finished.

The work is proceeding under the general direction of General Theodore Bingham, who is in charge of the defensive works of the eastern and southern entrances of New York Harbor.

It could not be learned when the anti-aircraft guns for the emplacements would be available for the city's defenses.

No More Civilian Instructors

The War Department has made a new ruling that civilian instructors will no longer be used in aviation schools and only commanding officers will do the instructing.

Six Aeroplanes for Camp Dix

According to information received by the New York Sun from Camp Dix, six military airships will arrive during the course of the week, permitting troop movements under conditions approximately war conditions on the front.

The planes will be assigned with their operators to the Signal Corps. Immediately upon their arrival, it was stated that the division and regimental commanders will work out field problems. Their solution will require the functioning not only of the aviators, but of the observers, photographers and wireless operators in the duties which they are to perform at the front. Lack of these aero units has made it impossible to secure approximate war conditions in the practice manoeuvres. The photographs and observations obtained by the flyers will make it possible for the men of the 303rd Engineer Regiment to learn exactly how efficiently their work of concealment has been carried out.

Steel Aeroplane Traps for Allied Aviators Report from Holland

At Zeebrugge, the German naval and aerial base on the Belgian coast, the Germans have adopted a new method of catching hostile airmen, according to an Associated Press report.

Toward evening, the "Telegraaf" (Amsterdam) frontier correspondent reports the Germans send up twenty captive baloons, without crews and attached to electrified steel cables. The electric barrier is said to constitute a menace to all airmen coming in contact with it.

The Germans, it is added, have also manufactured a new and improved type of aeroplane. It is fitted with three propellers, one being so arranged it can keep the aeroplane stationary above a certain point for a few minutes, thus permitting the bomb thrower to aim with greater accuracy.

Oregon Aids Aircraft Production

Oregon, which has been supplying a good proportion of the spruce used in the construction of aircraft, is now making efforts to enter into other fields of the aircraft production program, according to an editorial in "The Oregonian," of Portland. Colonel Disque, who is in charge of the Spruce Production Division of the Signal Corps, with headquarters in the Yeon Building, Portland, has recently let to Oregon planing mills contracts for the manufacture of aeroplane stock into wing beams.

The editorial then urges manufacturers to go into the production of linen which is essentially needed for the aircraft programme. The flax raised in Williamette Valley is equal to the best raised in Ireland.

Japanese to Prepare for German Air Raids

The Japanese army has formulated a definite plan to build 1,000 aeroplanes in the fiscal year, 1918-'19, and has sought the consent of the Imperial Diet, according to the "Osaka Asaki."

The immediate cause of the move was the possibility of Germany succeeding in establishing aircraft bases in Siberia along the Pacific seaboard.

"Let us suppose," Major Onokichi Isobe is reported to have said in an interview, "that Germany is able to establish a base at a point as near to our country as Harbin, for example. The enemy craft could make Japan in about seven or eight hours. Germany had about 1,000 aircraft on the Russian front. Suppose the Teutons were to decide to threaten the Far East through Russia. All that is necessary for our people to do is to recall what Germany has done to London and Paris through the air route."

Major Isobe and Major Sawayanagi are about to organize a company for the manufacture of aircraft in Japan. The company is to start with a capital of 500,000 yen and it intends to import motors from the United States.

Military Aeronautics in South and Central America

Arturo Escario, a Paraguayan aviator, has been sent to Europe to acquire the most modern aeroplanes for use at the Army Aviation Training School near Asuncion, Paraguay.

According to "A Noite," a daily newspaper of Rio de Janeiro, military aviation schools are to be established at Sao Paulo, Parana and Rio Grande do Sul, Brazil. Acero Marquez, a Brazilian aviator, will have charge of the school at Sao Paulo.

The Cuban Army has organized an Aviation Corps. Twenty aeroplanes have been ordered from the United States. Santiago Campuzano, who has seen active service on the front in France, is in charge of the instruction.

Waco Aviators Give New York "Giants" Hard Battle

In an exhibition game at their southern training camp, the New York "Giants" found worthy opponents in the "Waco Aviators," who held the National Leaguers to a 3 to 0 score.

About thirty aeroplanes soared over the ball field, doing stunts for the boys, including the famous nose spin and the Immerman dive. One daring fellow, at a height of 3,000 feet, turned eight successive loop-the-loops, while others dropped from high altitudes almost into the ball field.

Arkansas "Hayseeds" Fear Airmen's Stunts Will Scare Mules

Contending that aeroplanes flying overhead and landing in the vicinity would scare mules, smash down growing crops and cause negro laborers to leave their work to watch the birdmen, farmers of Arkansas, across the Mississippi River from Memphis, refused to lease land to the government to be used as a landing place for military aviators, training at Park Field. Eight landing places were secured in the immediate vicinity of Memphis.

Seaplane Destroys U-Boat, Despite Three Destroyers

Under a heavy attack from three German submarines and three German destroyers, a British seaplane recently persisted in her efforts againstst another enemy U-boat, and succeeded in sinking it before being damaged by the fire of the other enemy warships, says a recent Associated Press dispatch. The seaplane was on patrol duty at 8:30 o'clock in the morning when a submarine was sighted on the surface with a man standing forward by the gun.

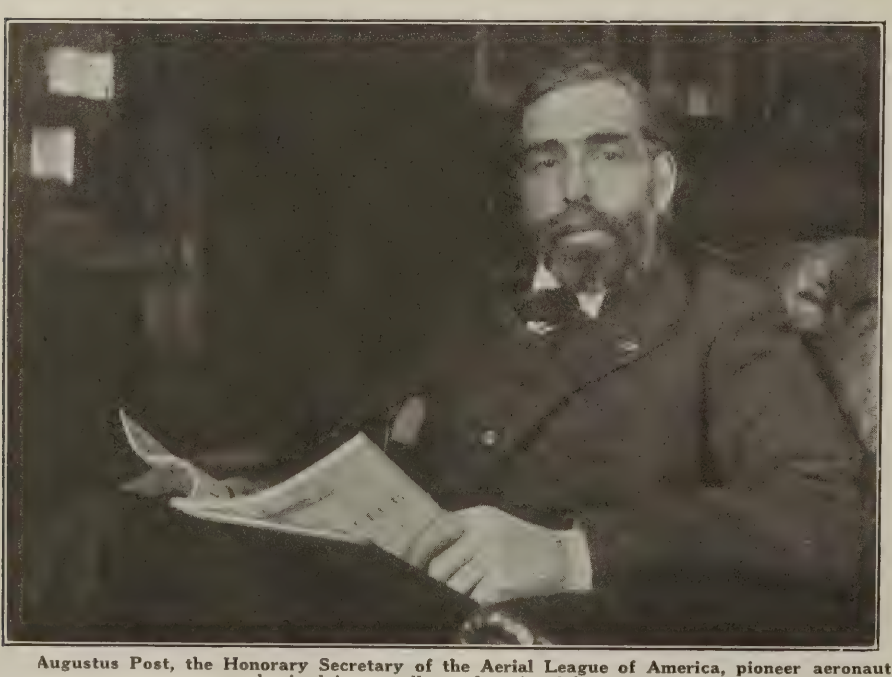
Increasing her speed, the seaplane dropped to an altitude of 600 feet and released a bomb. As she swooped around to repeat the attack, a shell from the U-boat burst in the air fifty feet from the propeller. It was seen that the bomb had made a direct hit, a big rent being visible in the deck of the submarine. Just then out of the mist ahead three more enemy submarines, followed closely by three destroyers appeared.

All six vessels maintained a hot fire against the seaplane. However, a second bomb was dropped on the disabled U-boat. It exploded fifteen feet ahead of the bow of the submarine. The whole craft shook and then sank quickly in a pool of oil, bubbles and wreckage. The seaplane, having no more bombs, and as the destroyers were coming near, returned to its base.

Seaplanes also have accounted for three other submarines. In one case two large seaplanes attacked a submarine on the surface and with two Germans standing on the conning tower. One plane dropped a bomb to the starboard of the U-boat, while the other placed one squarely in front of the conning tower. The explosion of the second bomb was followed by several explosions within the submarine, which disappeared.

Diving from a height of 4,000 feet to 1,200 feet, another seaplane dropped a depth charge on the spot where a submarine had disappeared. When the water subsided, the shape of the submarine could still be seen below the surface and a second bomb was dropped, "after which the ship disappeared."

An enemy submarine with two periscopes and about two hundred feet in length was sighted by a seaplane on patrol duty. The seaplane descended 3,300 feet to a height of 800 feet and dropped two bombs as the Germans submerged. One of the bombs made a direct hit just behind the conning tower. The submarine turned upside down and sank. Oil and wreckage later came to the surface.



Augustus Post, the Honorary Secretary of the Aerial League of America, pioneer aeronaut, who is doing excellent educational lecture work

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRC—Report to Riverside Field, Riverside, Cal.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1. Report to Camp John Wise, San Antonio, Tex.

Note 2. Report for temporary duty to points named in order given.

Note 3. Report to New York City for duty with department aeronautical officer.

Note 4. Report to School for Radio Mechanics, Austin, Tex.

Note 5. Report to Signal Corps supply depot, Detroit, Mich.

Note 6. Report to Signal Corps Aviation Mechanics' Training School, St. Paul, Minn.

Note 7. Report to district manager of inspection, New York, N. Y.

Note 8. Report to Hoboken, N. J.

Special Orders 65 to 68 Inclusive

A

Atkinson, Harold K.	PFO
Anders, Clarence Edward	SLR; TFT
Aimee, Joseph Marion	SLR; TFT
Aloe, Myron	SLR; EOT
Acheson, Alexander M.	SLR; DIK
Adkins, Klye C.	SLR
Allen, Greff	SLR
Avent, Ira M.	SLR
Albro, Preston M.	SLR
Arthurs, Addison E.	SLR
Andre, Harold Andrew	SLR: TFT
Archer, Allen T.	SLR; DIK
Aldredge, Sawnie R.	SLR
Abels, Walter J.	SLR
Atkinson, Harold K.	SLR
Auchard, Oliver C.	SLR
Amsden, Charles A.	FLR
Andrews, James B.	SLR
Armstrong, John F.	SLR
Abbott, Louis Hyer	SLR
Adams, James Douglas	SLR
Anderson, Richard Meriwether	SLR
Acheson, John Huyler	SLR
Allison, Arthur J.	SLR
Armes, Henry Lyman	SLR
Ashfield, Harvey	SLR
Allein, Henry C.	FLR
Ash, Thomas, Jr.	FLR
Armstrong, William J.	FLR
Allen, Richard C.	SLR
Angwin, Lewis E.	PRC
Appleton, James L.	FRF
Albro, Preston Morris	SLR; KST
Arthurs, Addison Ellsler	SLR; KST
Adkins, Kyle Crittem	SLR; KST
Acheson, Alexander Mahon	SLR; KST
Allen, Greff	SLR; DIK
Avent, Ira Marion	SLR; CWT

B

Banfill, Charles Y.	SLR
Barr, George D.	SLR
Bausher, John G.	SLR
Benedict, Robert P., Jr.	SLR
Bliss, Carlton M.	SLR
Brady, William T.	SLR
Brofft, Rudolph E.	SLR
Byron, William B.	SLR
Barry, Charles W.	REL
Brefft, Randolph E.	PFO
Barker, Nelson Earle	SLR; KST (2)
Blacklell, Frazer Nelson	SLR; KST (2)
Brant, Thomas James	SLR; KST (2)
Brooks, George H.	SLR
Bonsal, Stephen, Jr.	SLR; EOT
Baker, Walter L.	SLR
Baker, Robert L.	SLR
Baskin, Thomas H.	SLR
Bell, William P. B.	SLR
Bennett, Horace R.	SLR
Bennum, Chauncey H.	SLR
Blair, Bert R.	SLR
Blair, Samuel A.	SLR
Booth, Franklin O.	SLR
Borum, Fred S.	SLR
Bailey, John William, Jr.	SLR; EOT
Bacon, Vaughan R.	SLR
Ballard, Homer D.	SLR
Barnett, Arthur R.	SLR
Berg, Hennig J.	SLR
Boles, Charles F.	SLR
Breese, Robert P.	SLR
Brown, Harry B.	SLR
Barnard, George A., III	SLR
Baker, Russell G.	SLR
Bedell, Edward	SLR; TFT
Birkett, Howard	SLR; EOT
Barrett, Philip Arthur	SLR; KST
Baxter, Howard F.	SLR
Benton, Charles V.	SLR
Bryant, Harold B.	SLR
Bunting, Harry B.	SLR
Barbour, William M.	FLR
Beauclerk, Sydney W.	FLR
Bedlinger, Robert C.	FLR
Bennett, Alfred E.	FLR
Beardsley, Charles B., Jr.	SLR; PMT
Brew, Paul	SLR; PMT
Browning, Russell Inman	SLR; EOT
Bull, Henry T.	SPD

Buchanan, James Paschal	SLR; EOT
Boutwell, Leroy A.	SLR
Bowers, Eugene	SLR
Braukman, Clarence A.	SLR
Brooks, Edward J.	SLR
Bruce, Joseph W., Jr.	SLR
Buck, Walter F.	SLR
Burnham, Stahley	SLR
Byrne, Cranville W.	SLR
Brown, Isaac Griffith	SLR; EOT
Brooks, Arthur Raymond	SLR; TFT (1)
Berger, Francis A.	CSO
Behncke, David L.	DIK
Brofft, Rudolph Eugene	SLR; KST
Boland, Thomas	FRF
Boyd, John P.	DIK
Bancker, William D.	EOT
Bedell, Nelson H.	SLR
Black, Orlando B.	SLR
Blanton, Walter K.	SLR
Bolender, Fred J.	SLR
Boothe, Ross	SLR
Brown, Robert H.	SLR
Brunt, Shermer D.	SLR
Brooks, George Henry	SLR; GLC
Byron, William Devereux	SLR; RWT
Blair, Bert R.	FRF
Bliss, Carlton Merrill	SLR; KST
Bell, George E.	SLR
Bloom, Edward L.	SLR
Burr, Richard O.	SLR
Benedict, Robert Patterson, Jr.	SLR; RWT
Bedenhousen, Carl W.	FRF
Bigelow, Curtis R.	FLT
Brittain, John B.	RSD
Barr, Eugene O.	HHN
Barr, George Daniel	SLR; RWT
Brady, William Thomas	SLR; AAD
Brooks, Edward J.	DIK
Blatz, Edgar P.	RSD
Bausher, John Gerrish	SLR; DIK
Banfill, Charles Yawkey	SLR; KST
Baker, William Lester	SLR
Barnard, Leon William	SLR
Barrett, Clement James	SLR
Behr, Fred Arthur	SLR
Blum, Alexander	SLR
Bowman, Robert H.	SLR
Bucklin, William Norris, Jr.	SLR
Buhl, Lawrence D.	SLR
Burgher, Ballard Young	SLR
Brimm, Paul	SLR
Bailey, Frederick William	SLR
Birnbaum, Bert Jake	SLR
Branson, Harold Wodd	SLR
Bradley, Lyman Cook	SLR
Buckler, Douglas Arthur	SLR
Burrucker, William Charles	SLR
Bailey, Foster	SLR
Beach, Merritt S.	SLR
Black, J. Avery	SLR
Bolton, John H.	SLR
Brown, Harry D.	SLR
Burton, Joseph W.	SLR
Birdseye, Gerner K.	SLR
Brazelton, William L.	SLR
Brown, Austin H.	SLR
Burns, Charles H.	SLR
Bradley, Charles C.	SLR
Barrett, John M.	SLR
Bowen, Scott H.	SLR
Browne, Charles E.	SLR
Badham, Henry	FLR
Bradfield, William L.	FLR
Bennett, Horace Ralph	SLR; EOT
Brooks, Edward James	SLR; DIK
Barnes, Frank G. P.	Note 3
Balsley, Horace C.	Note 2 CSO; GLC
Bell, Robert M.	DIS
Bidwell, William M.	PRC
Blair, Bert Rot	SLR; KST
Benton, Charles Vandenbergh	SLR; KST

Lieut. George F. Flachaire of the French Air Service is now flying in Washington

Bryant, Harold Bingley	SLR; KST
Bunting, Harry Burch	SLR; KST
Blanchard, Leslie D.	FRF
Burwell, Harvey B. S.	EOT; RSD
Boots, Norman J.	SMM
Bowen, William S.	CWT
Buck, Walter Francis	SLR; KST
Blair, Samuel Abdill	SLR; KST
Borum, Fred S.	SLR; FRF; KST
Baker, Warren Lowe	SLR; TFT
Booth, Franklin Otis	SLR; KST
Beauclerk, Sydney W.	FLR; AEF
Barbour, William M.	FLR; AEF
Bell, William Parramore B.	SLR; KST
Bruce, Joseph Winter, Jr.	SLR; KST
Baskin, Henry	SLR; KST
Boutwell, Leroy Arthur	SLR; KST
Baker, Russell Gray	SLR; KST
Bowers, Eugene	SLR; KST
Byrne, Granville William	SLR; KST
Braukman, Clarence Augustus	SLR; CWT
Bennum, Chauncey Hancock	SLR; KST
Bedlinger, Robert C.	SLR; AEF
Burkholder, Albert N.	FRF
Bennett, Alfred E.	FRF; AEF

C

Calhoun, Ben A.	SLR
Cottingham, Kenneth C.	SLR
Callender, Marshall C.	SLR
Carter, Charles F.	SLR
Case, Leland I.	SLR
Cimmino, Frank	SLR
Clark, Earl W.	SLR
Clark, Harold F.	SLR
Clark, Ralph I.	SLR
Coyle, Walter W.	SLR

Inspection of naval aviators at Warrington Beach, Pensacola, Florida. (Com. on Pub. Inf.)

Crawford, Harry H.	SLR
Cronau, Robert T.	SLR
Chappell, Alfred H.	OSU
Cooper, Leslie B.	FLR
Cowgill, Lester B.	FLR
Comly, John	SLR; PMT
Campbell, Claude M.	SLR
Carhart, George B.	SLR
Carpenter, Martin F.	SLR
Catterall, Norman B.	SLR
Clarke, Stanley	SLR
Connor, William L.	SLR
Corbett, Frederick J.	SLR
Coulter, Bayard L.	SLR
Cheney, Christopher A.	REV; RSD
Cross, Price E.	FRF
Case, Ira H.	CPR
Coward, Raymond Stewart	SLR; DIK
Churchill, Henry Stern	SLR; GLC
Cabot, Thomas D.	SLR
Cahall, Ralph J.	SLR
Caraway, Talmadge E.	SLR
Chilton, Arch G.	SLR
Comstock, Keyon P.	SLR
Cooper, John H.	SLR
Copsey, Robert L.	SLR
Cottrell, George W.	SLR
Crane, Lester S.	SLR
Crowell, Reginald B.	SLR
Cady, Curtis Leland	SLR; GLC
Clifford, Paul Lawrence	SLR; TFT (1)
Chapman, Leonard Brintwall	SLR; TFT
Cooper, Richard D.	SLR; FRF
Carson, William H.	SLR
Cox, John D., Jr.	SLR
Caufield, John H.	FLR
Carley, Clyde H.	SLR
Clark, John F.	SLR
Cook, Howard E.	SLR
Covington, Harry S.	SLR
Crary, Allan H.	SLR
Crocker, George A., Jr.	SLR
Calhoun, Ben Allen	SLR; KST (2)
Cronau, Robert Theodore	SLR; KST
Coyle, Walter Wensley	SLR; KST
Coffing, Lawrence D.	DIK
Callender, Marshall Campbell	SLR; GLC; FRF
Crawford, Harry Huston	SLR; FOB
Cadwalader, Harry J.	CMV
Carter, Charles Faulkner	SLR; RWT
Cathcart, Sewell C.	EOT
Crane, Oliver P. H.	EOT
Curtiss, Frederick W., Jr.	EOT
Christian, Clarence H.	DIK
Clark, Harold Foster	SLR; KST
Cimmino, Frank	SLR; FOB
Clark, Ralph Ives	SLR; KST
Charlton, Howard C.	RSD
Chamberlin, Noel	RSD
Cady, Curtis Leland	FRF
Coan, Samuel	SRI
Callahan, Lawrence K.	FLT
Coffing, Lawrence D.	SLR
Caraway, Talmadge E.	DIK
Culbertson, Craig	SLR
Cutts, George B.	SLR
Compere, Harold	SLR
Coulter, William A.	SLR
Cudlipp, Jerome M.	SLR
Campbell, Marston, Jr.	SLR
Carrick, Spence Summers	SLR
Carroll, Howard R.	SLR
Chilson, Roy W.	SLR
Clancy, Edwin Menefee	SLR
Clark, Ezra Westcote	SLR
Cleveland, Bruce	SLR
Colt, Russell Griswold	SLR
Cormack, Joseph Marshall	SLR
Cowell, Charles Lewis	SLR
Caldwell, Jabin Bush	SLR
Cowgill, Russell T.	SLR
Coyle, Frank J.	SLR
Crum, Gay	SLR
Clark, Marshall Grant	SLR
Cooper, Robert Berry	SLR
Crissey, Sherman Barthollomeou	SLR
Carroon, William E., Jr.	FLR
Clevette, Charles F.	SLR
Clements, William T.	FLR
Coffee, Rector C.	FLR
Cousins, William S.	FLR
Campbell, Claude Melnotte	SLR; KST
Carhart, George Beavers	SLR; KST
Carpenter, Martin Francis	SLR; KST
Cutterall, Norman Bennie	SLR; KST
Cureton, James G.	Note 7; WCS
Carhart, Harold W.	FRF
Crowell, Reginald Bulkley	SLR; AAD
Churchill, Henry S.	SLR; DIK
Cady, Curtin L.	SLR; DIK
Coulter, Bayard Lamar	SLR; TFT
Chilton, Arch G.	SLR; KST
Cabot, Thomas Dudley	SLR; KST
Crane, Lester Stephen	SLR; KST
Connor, William Laurence	SLR; PMT
Comstock, Keyon Phiminister	SLR
Caraway, Talmadge Elisha	SLR; KST
Cooper, Robert D.	SLR; DIK
Copsey, Robert Lynn	SLR; KST
Cogan, James E.	Note 6
Cooper, Leslie B.	FLR; AEF
Cowgill, Lester B.	FLR; AEF
Cottrell, George Williamson	SLR; KST
Corbett, Frederick Jackson	SLR; KST
Carron, William E.	SLR; DIK
Cahall, Ralph Jones	SLR; KST
Cooper, John Harlan	SLR; KST
Clarke, Stanley	SLR; KST

D

DeHoog, Raymond Edgar	CDT
Dunbar, James Augustus	LDT
De Van, Howard Gove	SLR; KST (2)
Dusseau, Rudolph William	SLR; TFT
DeKay, George H	FLR; WFO
Durar, George Haven	SLR; KST
Darr, Harold S	SLR
Davis, Samuel H	SLR
Delaplane, John W	SLR
Dickinson, Charles E., Jr	SLR
Dobie, Richard L	SLR
Dorsett, Walker C	SLR
Dudley, Lloyd M	SLR
deSmet, George William, Jr	SLR; DIK
Davenport, Harbert	SLR
DeGolyer, Donald L	SLR
Denham, Robert N., Jr	SLR
Dillon, Oscar L	SLR
Dilworth, Joseph	SLR
Dorkey, Charles E	SLR
Drinkle, William E	SLR
Davidson, Oscar D	SLR
Dichman, Ernest W	FRF
Dewey, Maurice J	SLR
Donnan, Edmund A	FLR
Doherty, John P	SLR
Doyle, Victor H	WFO
Dyckinson, Robert W	CUI
Drayton, Emlen M	RSD
Doetjen, William L	FLT
Degon, Elmer F	SLR
Dey, Donald M	SLR
Dice, Agnew T., Jr	SLR
Dudley, John E	EOT
Dobie, Richard L	FRF
Dugger, Eugene F	SLR
Delaplane, John W	FRF
Davis, Roy Le Fevre	SLR
Dilworth, Dewees W	SLR
Driscoll, Edgar J	SLR
Drury, Newton Bishop	SLR
Davey, James Joseph	SLR
Doolittle, James H	SLR
Daves, Oliver H	FLR
Dawson, Thomas L	FLR
Dodds, Hiram E	SLR
Deloplane, John Washington	SLR; KST
Dorsett, Walker Creswell	SLR; KST
Darr, Harold Sanford	SLR; KST
Donnan, Edmund A	FLR; AEF
Dugger, Eugene F	SLR; DIK
Davis, Samuel Howard	SLR; KST
Davenport, Harbert	SLR; KST
DeGolyer, Donald Lee	SLR; KST
Dilworth, Joseph	SLR; KST
Dorkey, Charles Edward	SLR; KST
Drinkle, William Ernest	SLR; KST
Dickinson, Charles Elwell, Jr	SLR; TFT
Dillon, Occar Le Flore	SLR; KST
Denham, Robert Newton, Jr	ELR; KST
Dudley, Lloyd Marshall	SLR; CWT
Doutt, Robert H	Note 5 WCS

E

Elliott, James Henry	SLR; LDT
Eliot, Samuel	SLR
Edgerton, James Clark	SLR; EOT
Ellison, James Arthur	FRF
Easton, Wilbur W	SLR
Ewing, John K. M	SLR
Essley, Harry W	FLT
Edwards, Carl W	SLR
Edler, Raymond Charles	SLR
Easton, Wilbur Weston	SLR; KST
Ewing, John K. M	SLR; KST
Emery, George N	SLR; DIK

F

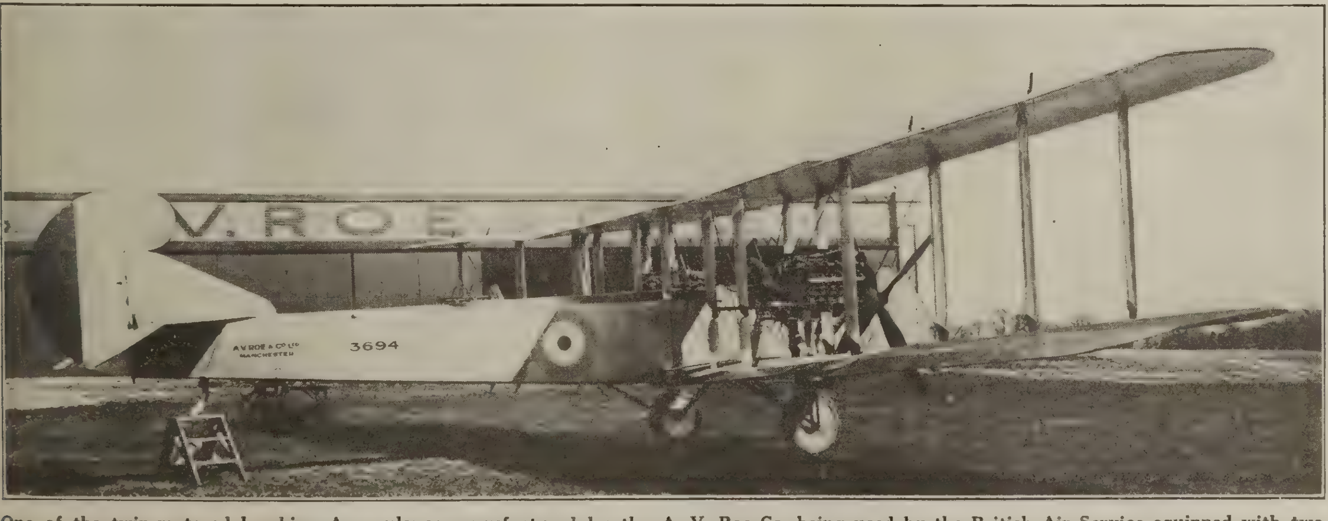
Farnsworth, Augustus P	SLR
Forgie, William L	SLR
Fowler, Gordon	SLR
Fox, George B	SLR
Franklin, John A	SLR
French, Jasper J	SLR
Frierson, Samuel G	SLR
Fenn, Russell S	SLR
Fisk, Henry C., Jr	SLR
Forbes, Wylie Hazard	SLR; LDT
Forbes, Howell	SLR; GLC
Frost, Ezra Rice, Jr	SLR; LDT
French, Donald E	SLR
Frinck, Henry P	SLR
Faurot, Henry, Jr	SLR
Ferguson, Philip M	SLR
Fillmore, William H	SLR
Foster, Carl A. C	SLR
Frye, Abram R	SLR
Fesst, Harry Cummins Landis	SLR; KST
Farris, William Benjamin, Jr	SLR; TFT (1)
Fischer, Edward G	SLR
Fischer, Milton A	SLR
Freeman, John H	SLR
Fretwell, Frank McG	SLR
Finlay, George D., Jr	OSU
Filley, Oliver D	CSO
Fernandez, Leslie A. J	FLR
French, Jasper J	SLR; KST
Fox, George Ball	SLR; KST
Forgie, William Litle	SLR; KST
Fisk, Henry Clay, Jr	SLR; ELA
Fetterhoff, Roy R	HHN
Frierson, Samuel Gordon	SLR; PMT
Fowler, Gordon	SLR; KST
Fenn, Russell Sargent	SLR; TFT
Farnsworth, Augustus Page	SLR; RWT
Franklin, John Armfield	SLR; ECT
Fitzgerald, Edmund, Jr	SLR
Flannery, William Blackman	SLR
Fuller, Clifford J	SLR
Farish, Stephen P	SLR
Fraser, Kenneth Eatiss	SLR
Frindel, Samuel, Jr	CSO
De Fremery, Leon	SLR
Fields, Curtis P	SLR
Friesen, Ernest C	SLR
Frazee, Harold D	SLR
Froehlick, Hugo F	SLR
Frost, John W	SLR
Ford, Bernard W	SLR
Fishel, Harry O	FLR
Frease, Walter J	SLR
Fleet, Rutherford	SLR
Fuller, Earl B	FLT
Ferguson, Philip Mitchell	SLR; KST
Franklin, John A	SLR; DIK
Freeman, John Henry	SLR; KST
Fernandez, Leslie Alexander Joseph	FLR; KST
Faurot, Henry, Jr	SLR; KST
Fillmore, William Haydock	SLR; KST
Fischer, Milton Albert	SLR; KST
Frank, Benjamin	PRC
Foster, Carl Alvan Cooper	SLR; KST
Frye, Abram Robertson	SLR; TFT (1)
Fischer, Edward George	SLR; KST
Fretwell, Frank McGee	SLR; KST
Frazee, Harold D	FRF

G

Gayton, Frederick L	CSO
Graham, Joseph Andrew	PFO
Gibson, Mortimer	SLR; LDT
Glynn, Martin Eugenius	SLR; LDT
Godfrey, Frank Harriman	SLR; LDT
Gibson, James R	PFO
Goodhue, Merrill M	SLR
Gill, Thomas H	SLR
Graham, Leland J	SLR
Giroux, Victor Leon	SLR; TFT (1)
Gardiner, Edwin I	SLR
Goulding, Frederick W	SLR
Griffith, Edward C	SLR
Gill, Joseph F	FLR
Gibson, James R	SLR
Gray, Ralph C	SLR
Gurvine, Richard J	AMV
Goodnow, Weston W	FLR
Greening, Wendell G	FLR
Galbreath, Thomas Morrison	SLR; TFT (1)
Gape, Lee B	FRF
Gibson, Peyton	SLR; LDT
Gordon, Charles	SLR
Gould, Edgar R	SLR
Green, Robert C	SLR
Griffin, Norval B	SLR
Griffin, Roscoe C	SLR
Grimes, David	SLR
Gulick, Edward L., Jr	SLR
Gay, John A	SBI
Goodhue, Merrill Miner	SLR; ELA
Gally, Thomas Kilburne	SLR
Gans, John Edgar	SLR
Gifford, Joseph Barney	SLR
Gore, Thomas Edwin	SLR
Griffin, William Louis	SLR
Gallinger, Nathan K	SLR
Garnier, Edward W	SLR
George, Rob R	SLR
Graham, Le Moyne R	SLR
Graham, Leland Jenkins	SLR; RWT
Gordon, George L	RSD
Guild, Sidney T	RSD
Greer, James F	FRF
Gifford, Lawrence W	FLR
Gates, Percivall T	FRF
Gilman, Arthur R	EOT
Gilmore, Donald H	SLR
Grider, John M	FLT
Guthrie, Murray K	FLT
Giroux, Victor L	FRF
Gill, Thomas Harvey	SLR; KST
Gillis, Roger	SLR
Golonsbe, George J	SLR
Grogg, Russell I	SLR
Greenhalgh, Charles G	FLT
Griffith, Edward Colville	SLR; BST
Griffith, Fred C	FRF
Goldsborough, George J	FRF
Goulding, Frederic William	SLR; BST
Gill, Joseph F	FLR; AEF
Goodnow, Weston W	FLR; AEF

H

Hawes, Herbert Richardson	SLR; SMM
Hoskins, Lawrence W	SLR
Hadden, Julian B	SLR
Halloran, Earl T	SLR
Haltom, Travis L	SLR
Hebbards, James L	SLR
Hiestand, Benjamin	SLR
Hill, Edward A	SLR
Hughes, George P	SLR
Haley, Ernest P	SLR
Haskell, Sidney C	SLR
Heath, Charles E	SLR
Heafer, Harold W	PFO
Hayward, John M	FRF
Hamilton, Mark A	SLR
Harris, William L	SLR
Haskins, Charles H	SLR
Hequembourg, Theodore M	SLR
Highley, Thomas H	SLR
Hightower, Charles D	SLR
Hillman, Alfred D	SLR
Haack, Theodore T	SLR
Halligan, Henry M. J	SLR
Harrison, William Winston	SLR; THT (1)
Hall, Howard A	FRF
Hall, Lysle G	FRF
Hartline, William Raymond	SLR; ECT
Hartshorne, Frank W. K	SLR; PMT
Hutterly, Andrew Julius	SLR; TFT (1)



One of the twin-motored bombing Avro planes manufactured by the A. V. Roe Co. being used by the British Air Service equipped with two Rolls-Royce motors. Photo courtesy of Avro Co., passed by British Censor.

Hunn, William Frederick	SLR; KST
Hall, John Clarence	SLR; KST
Harwood, Archibald R	SLR
Holt, Robert H	SLR
Hudgins, William H	SLR
Huser, Thomas E	SLR
Huston, Aubrey	SLR
Ham, David H	SLR
Hartwell, Cushman	JMA
Hill, Thomas Leo	SLR; TFT (1)
Howlett, Robert	CSO
Hart, Carl H	FLR
Hawke, Clarence E	SLR
Hendrickson, Charles J	SLR
Higgins, Curt E	SLR
Haskell, Sydney C	SLR; ECT
Hill, Edward Ashton	SLR; PMT
Hoskins, Lawrence Worth	SLR; PMT
Hilliard, Landon	FRF
Heath, Charles Edward	SLR; LDT
Haley, Ernest Philander	SLR; GLC
Hauser, Stanley F	KST
Hiestand, Benjamin	SLR; KST
Hall, John R	Note; 1
Harrell, Samuel C	SLR
Hays, Frank K	SLR
Hilliard, Landon	SLR
Himebaugh, Gero A	SLR
Harvey, George W	FLR
Halloran, Earl Thomas	SLR; RWT
Hughes, Earl C	FLR
Halton, Travis Lee	SLR; KST
Hebberd, James Lee	SLR; KST
Harding, Paul C	SLR
Hensley, James W	SLR
Hooper, Edwin M	SLR
Horrell, Camden R	SLR
Host, Thomas P	SLR
House, William R	SLR
Hughes, George Percivall	SLR; KST
Hall, William Ernest	FRF
Hamilton, Warren M	FLT
Hooper, Par	FLT
Henderson, Justin	SLR
Hicks, Leo R	SLR
Hosman, Everett M	SLR
Hugus, Z. Zimmerman	SLR
Heath, Hamlin R	SLR
Hostetler, Wilbur D	SLR
Howard, James G. L	SLR
Hughes, Francis F	SLR
Haller, Hubert G	SLR
Hamilton, Clyde M	SLR
Hogan, Clarks H	SLR
Heron, Percy H	SLR
Harmon, Frank Henry	SLR
Hayden, Thomas Heller	SLR
Haddon, Julian Buckner	SLR; KST
Hardin, Ray S	SLR

I

Ingle, Joseph L	PFO
Inglesby, Joseph Edmund	CDT
Isham, Howard Fuller	SLR
Irish, Harold R	FRF

J

Jones, Paul J	SLR
Jung, Eugene F. E	SLR
Jackson, Joseph W	SLR
Jackson, Norris D	SLR
Johnson, Charles C., Jr	SLR
Johnston, Edward McK	SLR
Jones, Montgomery O	SLR
Johnson, Howard H	SLR

Lieut. R. E. deCastro, of the Aviation Section, Signal Corps, former Associate Editor of Aerial Age Weekly

Johnstone, Edwyn	FLR
Jeffries, John Miller	SLR; GLC
Jackson, Joseph Walter	SLR; DIK
Jolly, James S	SLR
Jung, Eugene Frank Emil	SLR; CSO
Jeffries, John M	DIK
Jeffries, Simeon J., Jr	SLR
Johnson, Gordon Earl	SLR
Johnson, Rollin George	SLR
Jones, Paul John	SLR; KST
Jones, Fred L	SLR
Jones, Lee B	SLR
Judge, Joseph B	SLR
Joyce, Thomas F	RSD
Junkin, James W	FRF
Jenks, Frederick A	SLR

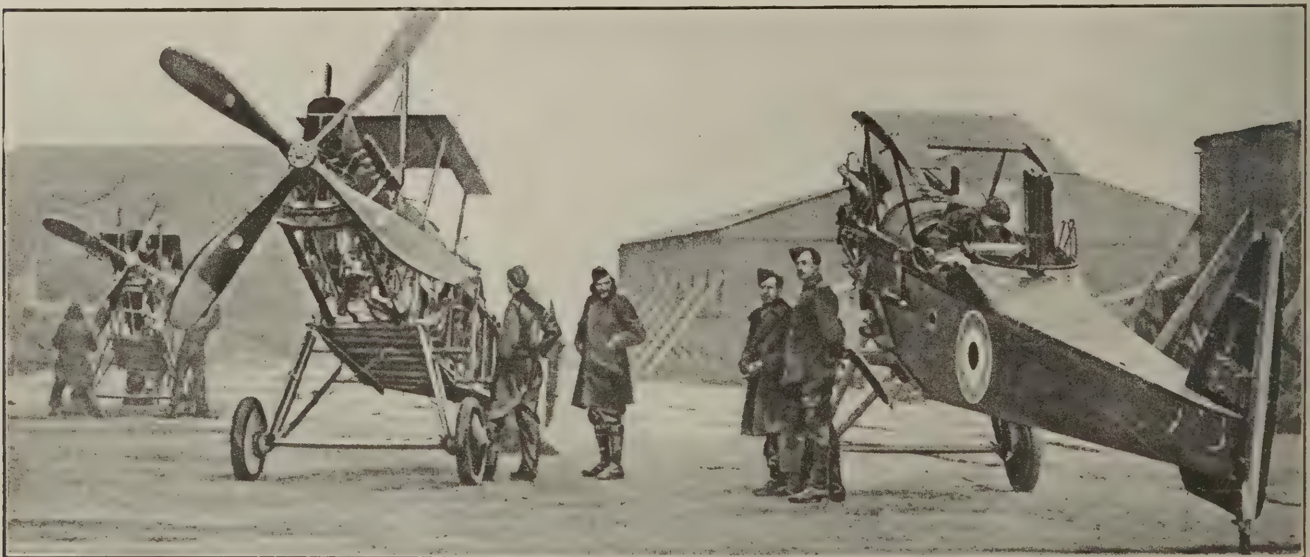
K

Knight, Arthur K	SLR
Knight, Louis R	CPR
Kindig, Theodore P	SLR; PFO; FRF
Kennedy, Clement Edwin	SLR; SMM
Kennedy, Frank E	SLR
Kinsmon, Harry Bruce	SLR; SMM
Kauffman, Stephen T	SLR
Kittell, Mellen F	SLR
Krohn, William	SLR
King, William Corbett	SLR; KST (2)
King, George T	SLR
King, Gelston T	SLR
Kelly, Frank V	SLR
Kelly, Philip John	SLR; KST
Koontz, John W	FLR
Koontz, Leonidas L	SLR; FRF
Kaplowitt, Mack B	SLR
Kindred, Herbert L	SLR
Kite, Warren P	SLR
Kirby, George P	SLR
Kellegrew, Edward W	SLR
Kirkpatrick, Oran G	SLR
Kent, George Silverthorn	SLR; LDT
Keeffe, Louis Richard	SLR; KST
Knapp, Robert D	SLR
Kruss, Edmund A	FLR
Krohn, William	SLR; KST
Kittell, Mellen Franklyn	SLR; RWT
Killgore, Edward W	HHN
King, George Tiffany	SLR; CWT
Kennedy, Ardis M	FRF
Kauffman, Stephen Timothy	SLR; KST
Kennedy, Frank Edward	SLR; RWT
Kelly, Martin P	FLR
Kelly, Robert A	FLR
Kelly, Fred W	SLR
Kelly, Edward R	SLR
Kimball, Dan A	SLR
Kemp, Louis W	SLR
Kunkel, Erick J	SLR
Kunkel, Frederick Eugene	SLR
Kroll, Harry D	SLR
Kendall, Edward H	SLR
Kerr, George R	SLR
Kreis, Stanley A	SLR
King, Paul Arthur	SLR
Keller, Fredweick W	SLR
Kingsland, George D	SLR
Kirkpatrick, Stewart R	SLR

L

Long, Carl C	SLR
Langley, John A	SLR
Lobdell, Jacob K	SLR; PFO
Lindquist, Harry M	PFO
Linson, Harry Webster	SLR; TFT
Lipscomb, Donald Ellett	SLR; KST
Lenox, William Joseph, Jr	SLR; EOT
Lochhead, Archie	SLR; TFT
Lathrop, Fred B	SLR
Leniham, William S	SLR
Lund, William J	SLR
Ludwig, Nicholas H	SLR
Lubbers, Edward S	FRF
Lee, Colin K	MSC
Lawson, Oliver M	SLR
Lloyd, Lawrence A	SLR
Logan, Patrick H	SLR
Lycan, William J. B	SLR
Lindeburg, Alfred	FRF
Limberg, Edward Armin	SLR; WFO
Lindsey, Harold	FRF
Lassiter, Glenn R	SLR
Leffler, Claude William Skilling	SLR
Lehr, Robert P	SLR
Lewis, Halstead Harden	SLR
Long, Leonard Franklin	SLR
Lownsbery, Guy Timpleton	SLR
Lundquist, Harry M	SLR
Lewis, Thomas J	AGC
Lutes, Herschel	AGC

(*Continued on page 215*)



Renovating and re-assembling aeroplanes after a period of service at the front. (British Official Photo.)

INVESTIGATIONS INTO THE AEROPLANE SITUATION

A Chronological Report of Events in Washington

THREE investigations are under way to discover why the aircraft program is 90 days behind its schedule, as claimed by the Senate Military Affairs Committee.

One is being conducted by Howard E. Coffin, chairman of the Aircraft Board, who is determined to run down the various reports and rumors; another by H. Snowden Marshall, chairman of the committee appointed by the President, who is working with the super-war council, and a third is being made by Gutzon Borglum, New York sculptor, who has a mysterious part in the situation.

Mr. Marshall's duties will include the investigation of the whole matter of delayed production. Mr. Coffin is working more specifically to run down reports and rumors of troubles in making the Liberty motors, which are believed in the main to be unfounded.

Mr. Coffin left Washington to make a complete tour of all the plants, and his report will be checked up later with the two others as well as those of officers of the Signal Corps whose duties include supervision of any mechanical or production irregularities which might develop.

March 26th

Senator Harry New, of Indiana, a member of the Senate Military Affairs Committee, told the Senate the War Department had not only failed to send a single aeroplane to General Pershing, but also will be unable to complete more than thirty-seven aeroplanes by July 1 out of last summer's programme calling for 12,000 planes.

Senator Lodge said:

"We know here and we have known for weeks, as the Germans have known, that we have no fighting planes in France. The Secretary of War spoke a short time ago of our beginning to send fighting planes to France. He said the number was small, but we had begun to send them. We returned at that time th etwo French models which we had had here. Since then I believe one American plane has gone; it may be on the water now; it may have been landed.

"The heavy Liberty motor, according to the best information I can get, may be developed so as to furnish adequate power for bombing planes. The light motor does not show a capacity for fighting planes. We have not a fighting plane in France. The front where our men are is not defended in the air. The French and the English have use for every plane they can bring up, and our men are not defended at all.

"We have spent $640,000,000 for aeroplanes in the last year, and we have not a fighting plane in France. I was shown a statement from the Aero Club of America, saying what was needed was money—three thousand million dollars to build aeroplanes. We have granted powers and we have given money without stint; but appropriating money and granting powers will lead to nothing unless the money is wisely expended and the powers are efficiently exercised.

"The facts I have recited in regard to aeroplanes are known to Germany. It is time our people understood them."

Though hampered by military censorship, the Aircraft Board, through a high official, turned on its accusers, according to a despatch in the *N. Y. American.* The charge made in the Senate that not one American built aeroplane is flying at the front is flatly denied. At the request of the Allies themselves it was stated America had rushed men and materials, rather than assembled machines.

Thousands of skilled shopmen from American aircraft and motor factories are in France and England making aeroplanes for our forces abroad. Thousands of tons of aeroplane material have kept pace with them. They are no less American aircraft for having been built abroad, the Aircraft Board claims.

The Liberty Motor is being used in quantity according to a most authoritative source of information, in the Aircraft Board. The period of test with the motor has passed; quantity production is established; the Allies have a high opinion of the U. S. twelves and "are asking for all we can send."

Referring to the Gutzon Borglum charges of incompetency, an official of the board denied that the Liberty Motor failed in a test at Mineola because a crankshaft broke. Another cause, unconnected with the motor, it was said, caused the plane to fall and the crankshaft was bent.

"Substantially, we are not behind time in the matter of the training aeroplanes, of which we have about 2,000," said Senator Hitchcock, in the Senate debate. "When I stated that an investigation was being made, I meant an investigation to develop who is responsible for the present delinquency of combat aeroplanes. We have every assurance in the Military Affairs Committee that a certain number of combat aeroplanes will be ready for delivery July 1. I mean the highest type of combat aeroplanes."

"The Senator does not seem to have the understanding of the term that the Aircraft Production Board has," replied Mr. Poindexter. "If I am correctly informed, we never shall be able, under the administration of this board, to see as the product of American genius the spectacle of a battle plane such as that exhibited to us here on Sunday afternoon, because it is not the intention of this Administration to make those planes."

"The Senator is in error, unles sthe committee is entirely misinformed," rejoined Senator Hitchcock.

"The committee has been misinformed," insisted Senator Poindexter.

"Last summer the Aircraft Production Board, in an excess of sanguine expectation, promised the country an enormous number of combat planes for a certain date of this year," explained Senator Hitchcock. "There were to be 20,000 of them early in 1918. Later this contemplated output was reduced to 17,000, then 15,000 and now it is 2,000 by July 1."

"A gentleman high in the Aircraft Production Board told me that some mysterious, unknown influence was putting a blight on the efforts of the board," replied Senator Poindexter. "He could not explain it. Now there was difficulty in getting spruce, yet there are quantities of it in my State and in Oregon. I, personally, have presented to the board offers of producers to deliver all the spruce the Government wanted, yet no notice was taken of it. The Government did not have the spruce, and it needed it to make the aeroplanes. It could have had it at its own price."

Senator Borah read from Mr. Borglum's report commenting on aircraft production, under date of January 2, in a letter to the President: "The situation indicates a terrible state of confusion and irregularity, as reports show, due to self-interest and intrigue, together with a predetermination of thwart the efforts of the nation."

Senator New of Indiana interjected the remark that the "aeroplane situation had not been exaggerated" by the Senators in the debate.

Senator Johnson of California asked Senator New if the latter, as a member of the Military Affairs Committee, could tell the aircraft program up to July 1 of this year.

"I think, while I had not intended to mention it, it is fair and just to say," replied Mr. New, "that the original program called for delivering in France 12,000 combat planes by the first of next July."

"Then I ask the Senator," urged Mr. Johnson, "if he can answer, if it violates no confidence, how many were delivered, or how many will this Government deliver on the first day of July in France?"

"Thirty-seven," replied Senator New.

"One of the statements made today," Senator Johnson proceeded, "is that it is in testimony before the Military Committee that the condition of our boys in the trenches today is such that, without let or hindrance, German planes are flying over them, and flying so low that our boys are shooting at them with revolvers. I want to know whether that is the testimony before the Military Committee?"

"It is," assented Senator New.

March 27th

The Senate Military Affairs Committee, learned through Colonel E. Lester Jones, head of the aviation supply division, that only one aeroplane had been shipped to Europe, according to the New York *Herald.*

The Committee on Public Information — the Creel Bureau—was called to account for sending out what Senator Wadsworth, of New York, called "misleading propaganda" about the progress of aviation production. The Military Committee voted to demand the suppression of pictures and captions, released to newspapers of March 30, giving glowing accounts of the large number of aeroplanes shipped to France.

In addition to the fact that but one aeroplane has been shipped to France the Senate Military Affairs Committee learned from Colonel Jones that twenty aeroplanes destined to France had been held up at Dayton for further experiments.

Senator Wadsworth called Colonel Jones' attention to the captions mailed by the Committee on Public Information to accompany photographs released to newspapers of March 30. The captions gave exaggerated accounts of the progress of the aircraft programme. They referred to hundreds of aeroplanes shipped to France and thousands more to follow soon.

The committee promptly summoned to the witness stand Laurence Rubel, head of the picture section of the Committee on Public Information. He said that the captions had been written by an assistant, Morris Strunsky. He had questioned Mr. Strunsky, he told the committee, and Mr. Strunsky informed him that he had written the capitions upon the basis of information contained in an official statement of Mr. Baker, Secretary of War.

"He told me Mr. Baker's statement was to the effect that 3,500 planes or parts of planes had been sent to France," said Mr. Rubel.

The committee voted unanimously to demand the suppression of the captions and photographs, and Mr. Rubel said he would comply.

March 28th

Investigation into delay in the aeroplane program was begun by the Senate Military Committee behind closed doors after several days of discussion in the Senate.

Members of the committee were pledged to secrecy, and Chairman Chamberlain announced that no statement would be issued until the inquiry had been completed.

Major General George O. Squier, Chief Signal Officer, and Colonel Deeds were the first witnesses called. They remained with the committee nearly four hours. The committee plans to hear Major General Franklin Bell, who has just returned from a visit to the American front in France. Later Commander Briggs of the British Royal Flying Corps, Colonel Waldon of the American Signal Corps, and Howard Coffin, Chairman of the Aircraft Board, will be called.

March 29th

Inquiry into aeroplane production was continued by the Senate Military Committee behind closed doors, with no indication when the investigation would be completed. Commander Briggs of the British Flying Corps was questioned for several hours, and later Major General Squier of the Signal Corps conferred with Senator Chamberlain of Oregon, Chairman of the committee.

The investigation, according to various Senators who have been present, has not revealed much that has not already been made public. Statements by army officers show, they say, that while training machines have been going over and many fighting planes have been made in France by American mechanics from American material, only about twenty-five American-made fighting aeroplanes will be delivered in France by July 1 instead of about 12,000, as proposed under the original program.

Two fighting planes had been shipped to France, the witness told the committee, according to the New York *Times,* fourteen more were ready to be sent abroad, and about a dozen others were in the final stages of construction and should be ready for shipment shortly. Fighting machines sufficient to compose three squadrons of eighteen machines each have been constructed in French factories from American materials and by American mechanics sent abroad for that purpose.

Statements made on the floor of the Senate that the Liberty motor so far has been used only in bombing machines, and other planes which do not need the extraordinary speed of the little single-seated fighters, are understood to have been confirmed by the witnesses, though they praised the work of the motor.

Members of the Military Committee will again visit the War Council at the War Department. It is understood they are not inclined to investigate charges made in the Senate by Senator Overman of North Carolina that there are spies in the Curtiss plant. Chairman Chamberlain said that it was a matter to be handled by the Department of Justice.

Publication of misleading statements regarding progress on the aircraft programme in the Official Bulletin issued by the Committee on Public Information caused a bitter arraignment in the Senate.

The material printed in the bulletin which aroused the Senatorial wrath had been condemned by the Senate Military Affairs Committee. It appeared in a photograph caption sent out to newspapers several days ago in which is was stated that "hundreds of aeroplanes have already gone to France and thousands upon thousands will soon be ready."

As against this statement, the Committee on Military Affairs discovered only one 'plane has been sent over. An investigation to establish the source of the caption writer's information was begun, and Lawrence Rubel, director of the division of pictures of the Committee on Public Information, who was called as a witness, admitted the information was misleading, and when the committee voted to request it be withheld from publication gave the body his pledge it would be suppressed.

Despite the pledge that the captions would be withdrawn from newspapers to which they had been sent and would be suppressed entirely, they were inserted in the Official Bulletin.

CURTISS GRANTED FLYING BOAT PATENT

THE United States Patent Office granted on February 19, 1918, the claims made in an application filed on December 11, 1914, by Glenn H. Curtiss, the well-known aeroplane constructor of Hammondsport, on behalf of a patent covering the construction of stepped and V-bottomed flying boat lulls. The specifications and claims follow in full.

To all whom it may concern:

Be it known that I. **Glenn H. Curtiss**, a citizen of the United States residing at Hammondsport, in the county of Steuben and State of New York, have invented certain new and useful Improvements in Hydro-aeroplane-Boats, of which the following is a specification.

My invention relates to hydroplane boats of the type commonly used in connection with hydro-aeroplanes of the flying boat type. It has for its objects the enabling of the craft to rise quickly from the water with maximum load aboard and having risen from the water to enable operation in the air with a minimum of head resistance due to the body of the boat. To these ends the main flotation body of the boat is given a longitudinal section of approximately stream line form, and a transverse section increasing in size from the head of the boat to a maximum approximately one-third length astern, and thereafter gradually decreasing in cross section until the tail of the boat is reached. This cross section is approximately the shape of an ellipse with one or both ends or sides cut off to form the bottom of the boat, or the top thereof, as the case may be. Further I decrease the minor axis of the ellipse more rapidly than the major axis as the cross section is decreased in the immediate vicinity of the tail of the boat, so that the section becomes substantially a straight line terminating in the vertical rudder post. Previous to this, the separate axes are independently varied in the rearward progression of adjacent cross sections to obtain the streamlines with which the boat is characterized, and to bring out to the fullest extent the features of efficiency above enumerated. The bottom of the boat is stepped and the front portion thereof constitutes the active hydroplaning surfaces, while the rear portion thereof underlying the tail proper makes a salient angle therewith. Preferably the hydroplaning bottom is V-shaped. On the sides of the boat are formed excresent structures the bottoms of which are in continuation of the hydroplaning bottom of the boat and the longitudinal section of which is of streamline form. Preferably these excrescent structures are water tight, and are of an approximately triangular section.

In the accompanying drawings, I show one embodiment of my invention but wish it understood that as usual in the case of an invention of this character, my invention is capable of many other embodiments without departing in any wise from its generic spirit.

Of the drawings Figure 1 is a side elevation of the boat of my invention.

Fig. 2 is a plan thereof.

Fig. 3 is a front elevation thereof showing aerial supporting surfaces attached and

Figs. 4 to 10 inclusive are transverse sections on lines 4 to 10 of Fig. 1.

10 designates the flotation body of the boat. As clearly indicated in the side elevation and plant of Figs 1 and 2 this body has a longitudinal section approximately stream line in form. There are a few slight irregularities in its surface, but these are insufficient to detract from the behavior of the boat in air as a streamline body. The principal variation is at the head or prow of the boat, where the top is cut straight back on the line 11 to form a front deck, and give unobstructed vision from the cabin 12. To complete the elevational stream line the cabin roof line would naturally be downwardly curved to round off into a substantially elliptical juncture with the nose. This forward elevational stream line, however, is interrupted by the provision of the fore deck 11 which extends horizontally and rearwardly to an intersection with the cabin, a cockpit being provided at the intersection of this deck with the cabin and a conning top having windows set therein being furnished to inclose this cockpit and to round off the interrupted lines of the cabin forwardly. The side and top walls of the cabin merge into the stream line of the body aft as indicated in Fig. 1. Entrance to the cabin is by a hatch door 13 in the top and preferably located beneath the upper aerial supporting surface whereby it is shielded from the weather.

The transverse section of the body of the boat is in the form of an ellipse cut away in some cases at opposite ends of an axis and in other cases at one end only. The section at the front of the boat as clearly shown in Figs. 4 to 7 is in the form of an ellipse cut away at each end of an axis, while the section at the tail of the boat as shown in Figs. 8 to 10 is in the form of an ellipse cut away at the lower end of one axis only. In the form shown this axis is the major axis, all of the major axis lying in the longitudinal vertical plane of the body. The cross section increases gradually to a maximum approximately one-third way astern, and thereafter decreases gradually. Both axes decrease proportionately for a part of the rearward distance traversed, then the major axis is shortened at the more rapid rate and finally the decrease of the minor axis of the elliptical section is made more rapidly than that of the major axis. These three successive stages clearly appear from inspection and comparison of Figs. 7-8, Figs. 8-9 and Figs. 9-10 respectively, the elliptical section eventually becoming a straight line in the rudder post 14. In other words the transverse section may be described as varyingly elliptical, the size of the ellipse (rearwardly from the prow) passing through successive stages in which (*a*) the major axis increase rearwardly, more rapidly than the minor axis (*b*) both axis decreasing rearwardly, and (*c*) the minor axis decreases at a more rapid rate than the major axis, the said sectional ellipsese terminating in a straight line at the rudder post.

The bottom of the boat is stepped as indicated at 15 (Fig. 1). The front portion thereof is of V section the angularity of which increases gradually from the stem 16 to the step 15 as indicated clearly in Figs. 4 to 7. Also it will be observed there is an abruptly increasing and then a gradually decreasing concavity of the opposite sides of the V-bottom merging into the substantially flat salient surfaces at the step 15. It will be observed, however, that this concavity is not great in any case, and further that the downward and rearward inclination of the bottom at the keel 17 is substantially the same as that at the chimes 18, excepting at the upwardly inclined prow of the boat which portion of course has no hydroplaning function.

Projecting laterally from the sides of the flotation body 10 at or near the chime lines 18 are elongated excrescent structures 19. These structures have an approximately stream line form as clearly appears from Figs. 1 and 2. Transversely they are of approximately triangular and varying cross section, one side of the said section being in continuation of the transverse section of the bottom of the boat (see Figs. 6 and 7), whereby their under surfaces constitute continuations of the main hydroplaning services, another side conjoining the sides of the main body 10, and the third side extending downwardly and latterally therefrom. Considering the conjoint sides of the hull and fin excrescences as identical, as is usually in the preferable construction, it will be observed that the fins in cross section then become of an acute V-shape, one side of the V lying in the plane of the bottom and the other side intersecting therewith from the hull. These excrescent structures 19 are made watertight independently of the main body 10 and in the embodiment shown are each hermetically sealed. The two structures 19 and the front portion of the main body 10 make a total of three longitudinally extending watertight compartments. The front portion of the main body 10 is further transversely subdivided into watertight compartments as indicated by the dotted line bulkhead 20. The tail portion of the boat is also divided into watertight compartments by transversely extending bulkheads 21.

Aerial supporting surfaces 22 extend laterally from the body 10 as indicated. In the preferred form of my invention, there are provided a multiple number of these surfaces in superposed relation constituting the cell of a biplane or triplane as the case may be.

The fins 18, it will be observed, extend considerably beyond the center of the wings and therefore the hydroplaning area and lift is augmented in the neighborhood of the center of gravity and center of pressure as it should be. This location of the fins 18, although most effective, after having gained the surface of the water, is of little importance in gaining this end. More important is it that the fins should be located in the vicinity of the resultant center of hydroplane lift so that the hydroplane lift will be increased at the point where it is most needed to be increased and at a point providing for quick rise from a submerged position at rest to a hydroplaning position upon the surface of the water at speed. The great advantage in so locating the fins is that the enormous thrust value occasioned by the elevated location in the motorer motors (not shown) is offset and the boat prevented from nosing under when coming to a hydroplaning position and when hydroplaning—especially when traveling at comparatively slow speed. In explanation, it is to be noted that three working forces are in evidence, to wit: gravity, thrust and hydroplane lift. Unless the hydroplane lift is sufficient to counteract the force of thrust, then the boat will have a tendency to plane with its nose low in the water. Were the fin excrescences omitted, the size of the fore body of the hull would have to be materially increased so that the hydroplaning area might be proportionately enlarged. This is objectionable because of the added weight and increased resistance during flight. The resultant center of hydroplane lift is shown by calculation to lie approximately one-third back of the forward end of the hydroplaning surface.

With this understanding of the structural embodiment of my invention, it will be clear that I have attained the objects thereof. The extended and very large hydroplaning surfaces provided by the bottoms of the excrescent structure 19 in conjunction with the main body 10 are of sufficient size to enable the body to come rapidly to its hydroplaning position and to rise from that position into the air with maximum load. In a recent trial, over a ton of useful load was lifted from the water in a run upon the surface not exceeding five hundred feet. The flying boat took to the air with great ease. As the head of the boat is pointed upwardly for the craft to take to the air, the tail, which until then is clear or substantially clear of the water is carried downwardly into contact therewith, the boat being as it were rocked about the step 15 as a

FIG.1.

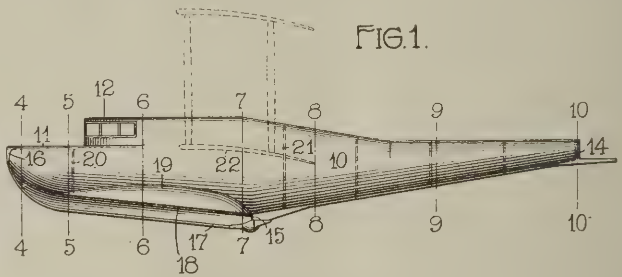


FIG.2.

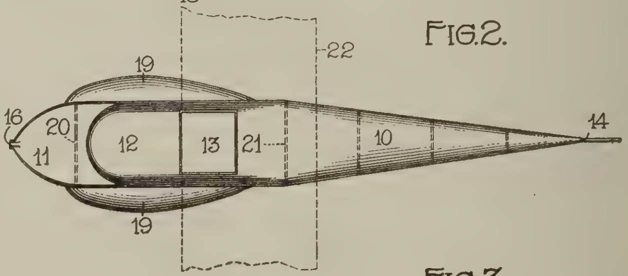
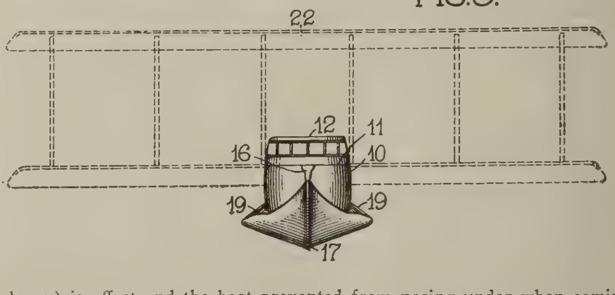


FIG.3.



pivot. This assists in enabling the boat to rise easily from the surface of the water by reason of the increased flotation and additional planing surface provided at the critical point in the operation. When the craft is in the air, the longitudinal stream line formation of the excrescences 18 prevent them from materially increasing the head resistance of the boat. Under actual flying conditions it was found that they produced no noticeable retarding effect. Of course, the longitudinal streamline section of the body as a whole is productive of the same excellent results obtained in prior flying boats of my invention.

While on the surface of the water (or in the air for that matter), the operator has an excellent footing on the flat deck 11 and its form and location are especially adapted for the mounting and operation of machine guns for military purposes. The operator further has at all times unobstructed vision ahead directly over the flat deck 11, which forwardly mutilates the generating boat line of the cabin which would normally round off into the nose of the body.

The sealing of the excrescent structures 18 independently of the main body 10 gives to them the additional and very important function of watertight compartments. They are located at a point where these compartments are very much needed, directly opposite the cabin 12. It is of course not practicable to seal the cabin section. The flotation of this section of the boat is thereby materially raised and is assuredly of sufficient value under all conditions of service.

I claim:—

1. An aeroplane body comprising a main flotation body, the bottom of which is shaped to form hydroplane surfaces, and forwardly located marginal excrescent structures on the sides of said main flotation body, the bottoms of which are coextensive with and in continuation of the hydroplaning surfaces of said bottom.

2. A hydroplane boat comprising a main flotation body, the bottom of which is shaped to form hydroplaning surfaces, and marginal excrescent structures on the sides of said flotation body, extending longitudinally substantially the full length of said hydroplaning surfaces and having their bottoms in continuation of said hydroplane surfaces.

3. A hydroplane boat for hydroaeroplanes comprising a main flotation body, the bottom of which is shaped to form hydroplaning surfaces, and forwardly located excrescent flotation structures of triangular cross section on the sides of said main flotation body opposite the resultant center of aeroplane lift, one side of said section being in continuation of the transverse section of the bottom of the boat, another side parallel to the side of the main body, and the third side extending laterally and downwardly from a point on the side of the boat intermediate the chime and the gunwale.

FIG.4.

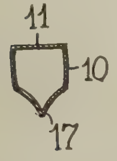


FIG.5.

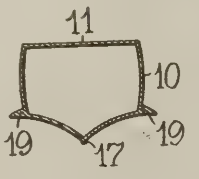


FIG.6.

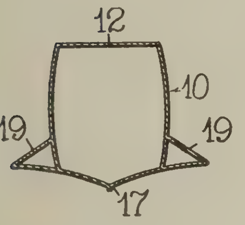


FIG.7.

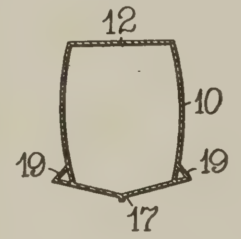


FIG.8.

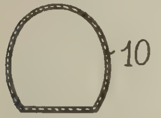


FIG.9.

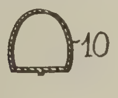


FIG.10.

4. A hydroplane boat body having an interior water-tight space for occupancy by the flying crew or other useful load together with watertight fin excrescences arranged to flank said space in the vicinity of the bottom of the boat, the excrescences conjointly functioning as planing surfaces and as lateral watertight compartments protecting said space.

5. A hydroplane boat body having an interior watertight space for occupancy by the flying crew or other useful load together with watertight compartments respectively ahead of, aft of, and at each side of said space, the side compartments being in the form of fin excrescences arranged to extend out laterally from the boat body proper to augment the hydroplaning area thereof.

6. A flying boat adapted to travel upon the surface of the water, rise therefrom and travel through the air, comprising a hydroplaning bottom surface laterally extended beyond the plane of the gunwales of the boat body proper by fin excrescences arranged at opposite sides of said body principally ahead of the center of gravity of the craft, the corresponding surfaces of said excrescences making a dihedral angle with the vertex thereof in the vertical plane of the keel line of said boat.

7. In a hull for flying boats, a V-shaped hydroplaning bottom and acutely V-shaped planing fins, each fin having one side formed in the plane of one of the V-sides of the bottom.

8. In a hull for flying boats, a V-shaped hydroplaning bottom, integral continuations of said bottom forming surfaces projecting beyond the hull and second surfaces projecting from the sides of the hull for intersection with the first said surfaces.

9. A flying boat including a main flotation body having a hydroplaning bottom, and fin excrescences arranged to augment said bottom laterally in the vicinity of the resultant center of hydroplane lift as determined through hydroplaning action on the surface of the water and preparatory to flight.

10. In a hull for flying boats, a V-shaped hydroplaning bottom and auxiliary planing fins formed as lateral extensions of said bottom, said fins being enlarged rearwardly from the bow of the hull in directions providing longitudinal and transverse stream lines.

11. In a flying boat, a hull rounding off rearwardly from its bow to provide a hydroplaning bottom and rounding off oppositely to provide a cabin situated over said bottom, and a fore deck for the hull intersecting the generating hull lines for the cabin.

12. A hull for flying boats enlarging rearwardly along rounded, upper and lower longitudinal hull lines, a hydroplaning bottom for the hull merging into the lower hull lines, and a deck intersecting the upper hull lines for provision of a cabin over said bottom.

13. In a flying boat, a hull, a cabin having streamlines merging integrally into the hull in one direction and a conning top rounding off the streamlines of the cabin in the other direction.

14. A hull for flying boats having its elevational aspect determined by lines rounding off rearwardly both upwardly and downwardly from the nose of the hull, and a deck intersecting the said upper boat line and cutting down the hull to provide a cabin.

15. In a hydroplane hull, an overhanging bow having an elevational aspect determined by lines rounding off rearwardly and downwardly, a bottom V-shaped in cross section, the angled portions of the bottom having their inception at the bow and considerably above the water line, each portion being decreasingly concaved from the nose rearwardly and the angle between the portions rearwardly, approaching a maximum obtuseness, and a step terminating said bottom.

16. In a hydroplane hull, a fore-body, a tail, a planing step dividing the bottom of the fore-body from the tail bottom, an upper surface for the tail enlarging forwardly in a reverse curve over said step and a cabin roof provided over the fore-body in advance of said step and merging into said enlarging tail surface.

17. In a hydroplane hull, a fore-body, a tail, a planing step dividing the bottom of the fore-body from the tail bottom, an upper surface for the tail enlarging forwardly in a reverse curve over said step to form a cabin roof for the fore-body and a deck intersecting said fore-body at a distance below said roof and destroying a normal merging of the roof line into the nose of the hull.

18. In a hydroplane hull, a fore-body, a tail, a cabin provided for said fore-body and having a roof merging rearwardly into said tail and forwardly into the nose of the hull, a deck intersecting the cabin and a cockpit provided at the intersection of said cabin and deck.

19. A flying boat including a flotation body having an underneath hydroplaning surface of a size in cross section designed to extend out on either side beyond the boat body proper approximately opposite the center of hydroplane lift, the bottom surfaces of the laterally extended portions making a dihedral angle with the vertex of the angle in the vertical plane of the keel line of the boat.

20. A flying boat including a main flotation body having an underneath hydroplaning surface of substantially V-form in transverse section, fin excrescences arranged to augment the hydroplaning surface laterally in the vicinity of the resultant center of hydroplane lift, the bottom surfaces of the fins continuing uninterruptedly the hydroplaning bottom of the boat body proper.

21. A flying boat including a main flotation body, a hydroplaning under surface, and lateral extensions of a construction designed to conform longitudinally to said hydroplaning under surface and to extend substantially the full length thereof.

22. In a hydroaeroplane boat body, a bottom longitudinally convexed, and auxiliary planing surfaces formed as lateral extensions of said bottom in the vicinity of the resultnt center of hydorplane life, said center lying considerably in advance of the point of maximum convexity, and sufficiently distant therefrom to provide for its movement rearwardly to a point in the vicinity of said point of maximum convexity upon fore and aft oscillation of the boat.

23. In a hydroaeroplane boat body, a bottom longitudinally convexed, aeroplane wings extending intermediately across said body, the point of maximum convexity underlying said wings, auxiliary planing surfaces formed as lateral extensions of said bottom, said surfaces commencing in advance of the resultant center of hydroplane lift and terminating rearwardly in the vicinity of said point of maximum convexity.

24. In a flying boat, a main flotation body, a hydroplaning under surface, fin excrescences coextensive with the hydroplaning surface, each fin extending forwardly beyond a line in the vertical plane of the resultant center of hydroplane lift a greater distance than to the rear thereof.

25 A flying boat including a forward hydroplaning bottom designed to extend from end to end uninterruptedly and at an angle laterally beyond the sides of the boat body proper to materially increase the hydroplaning surface and enable the boat to come rapidly to its hydroplaning position upon the surface of the water and to rise from that position into the air.

26. In a hydroplane boat, a bottom longitudinally convexed, and auxiliary planing surfaces formed as lateral extensions of said bottom to extend substantially to the full length of that portion of said bottom ahead of a point determining the maximum convexity thereof.

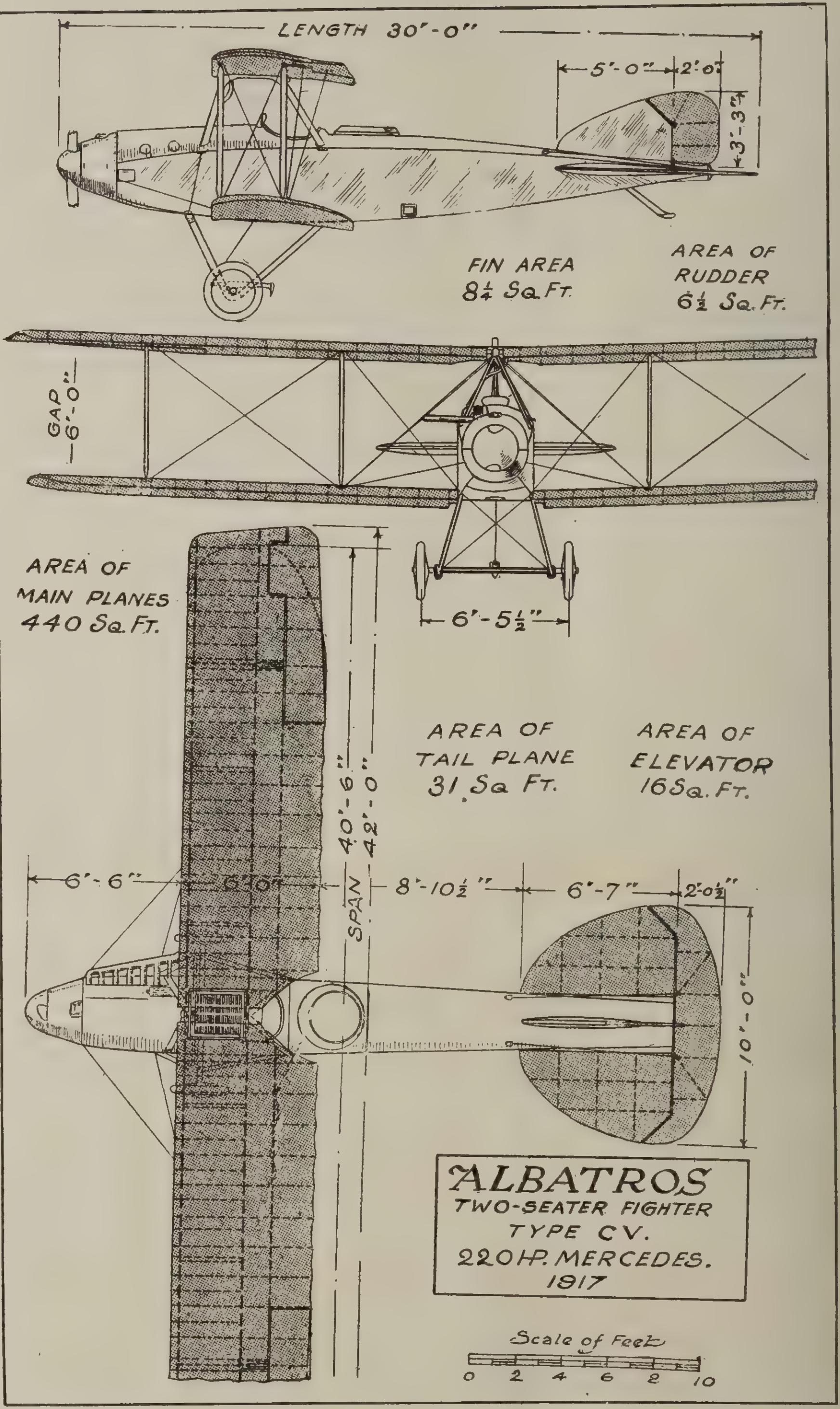
27. In a hydroaeroplane flotation body, a longitudinally convexed bottom in which that portion of said bottom in advance of the point of maximum convexity is of hydroplaning form, fin excrescences arranged to augment said bottom laterally in the vicinity of the resultant center of hydroplane lift, aeroplane wings, the center of pressure on said wings being disposed in the approximate transverse vertical plane of said point of maximum convexity, and said point determining the rearward terminus of said fins and the rearmost point to which the center of hydroplane lift may be shifted as the body in its entirety is oscillated fore and aft.

In testimony whereof I affix my signature in presence of two witnesses.

GLENN. H. CURTISS.

Witnesses:
T. R. Hall,
H. C. Genung.

THE ALBATROS TYPE "CV" FIGHTER*



THIS Albatros biplane belongs to what is now commonly referred to as the "C" class—that is to say, a general utility machine used for artillery observation, reconnaissance work, photography and fighting. Incidentally the machine appears to be also used for bombing—in a small way only—as it is equipped with a bomb rack holding four bombs.

Aerodynamically the Albatros to be dealt with in what follows is, perhaps, chiefly interesting on account of the evident attempt on the part of the designer to provide as good a streamline body as is possible having regard to such external fitments as machine guns, etc., which naturally detract to a certain extent from the efficiency of the lines of a body of a modern two-seater, where the gunner frequently has to stand up, with the upper portion of his body projecting above the fuselage covering. This effort at streamlining is particularly noticeable in the nose of the machine, where the aluminium cowling over the engine is carried right across, leaving only the exhaust collector exposed. In front of the covering of the body proper is a cowl shaped as a truncated cone, which serves to enclose the nose and reduction gear of the engine, and to carry the lines of the body into those of the "spinner" around the boss of the air screw. The sides of the body, from a short distance behind this cowl to the tail, are flat, as is also the bottom, but the top of the fuselage is covered with a curved covering of three-ply.

At the rear the fuselage terminates in a horizontal knife's edge, an easy flow being provided for the air by running the top covering of the fin into the three-ply covering of the fin in a smooth curve. Similarly, the fixed tail plane, which is of a symmetrical section and very deep, has its top surface practically in continuation of the top covering of the body, presenting no great and abrupt changes in curvature. The total effect is one of extremely smooth and easy flowing curves, and the body resistance cannot be very great in proportion to the cross sectional area of the body. We have no figures of the actual resistance coefficient in the formula $R = k\,AV^2$, but are inclined to imagine that the coefficient k has quite a low value.

As regards the rest of the machine, the Albatros designer does not appear to have been so careful in cutting down resistance. For instance, the wings have the usual circular section stranded cables for taking lift and landing stresses, and no attempt appears to have been made at streamlining these.

Constructionally the Albatros shows much that is of interest, chiefly in the construction of the body, but also in other respects, as we hope to show in later instalments of this descriptive article. Fundamentally, the Albatros body construction is that employed in building light boats and hydroplanes. There is a light framework, consisting of four main rails at the corners of the rectangular section body, two auxiliary rails somewhere about half-way up on the sides, and bulkheads or transverse partitions of varying shape and thickness along the body at intervals. The whole is then, as in boat building, covered with a skin of veneer ply-wood, in this case three-ply. Regarded as acompromise, this form of body construction would appear to be quite good. Without entailing the time and expense of the true *monocoque* body, it provides a reasonably good streamline form. As a manufacturing proposition it is probably about equal to the girder type of fuselage, while it has the advantage of not requiring any trueing up in the erecting process, this following automatically when making the parts over jigs and formers. One advantage this form of body does appear to possess, although to a somewhat lesser extent than the true *monocoque*—shell splinders and rifle and machine gun bullets are less likely to damage it seriously than is the case with the girder type. In the latter, should a longeron be shot through nearly all the strength of the structure is gone, whereas this semi-*monocoque* structure would retain its strength even after damaging some of the longitudinal members.

Finally, there is the question of strength for weight. We have no data relating to tests of such a structure carried out by our own authorities (although possibly such tests may have been, and certainly should be, made. But in an issue of *Flight* of April 4th, 1914, there was published particulars of an Albatros biplane which was brought over to England and flown by Thelen, which had a body fundamentally similar to the one at present under discussion, although differing from it in minor details. At the time we were furnished with some particulars of tests carried out on an Albatros fuselage of this type by the *Deutsche Versuchsanstalt für Luftfahrt*, according to which the factor of safety of the Albatros body was about 60, and the resistance to bending 2.5 times greater than that of a diagonally wired fuselage of the same outside dimensions, and having members of the size usually employed in structures of this type. The *Versuchsanstalt* also stated that the Albatros firm

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*Courtesy of *Flight*, London.

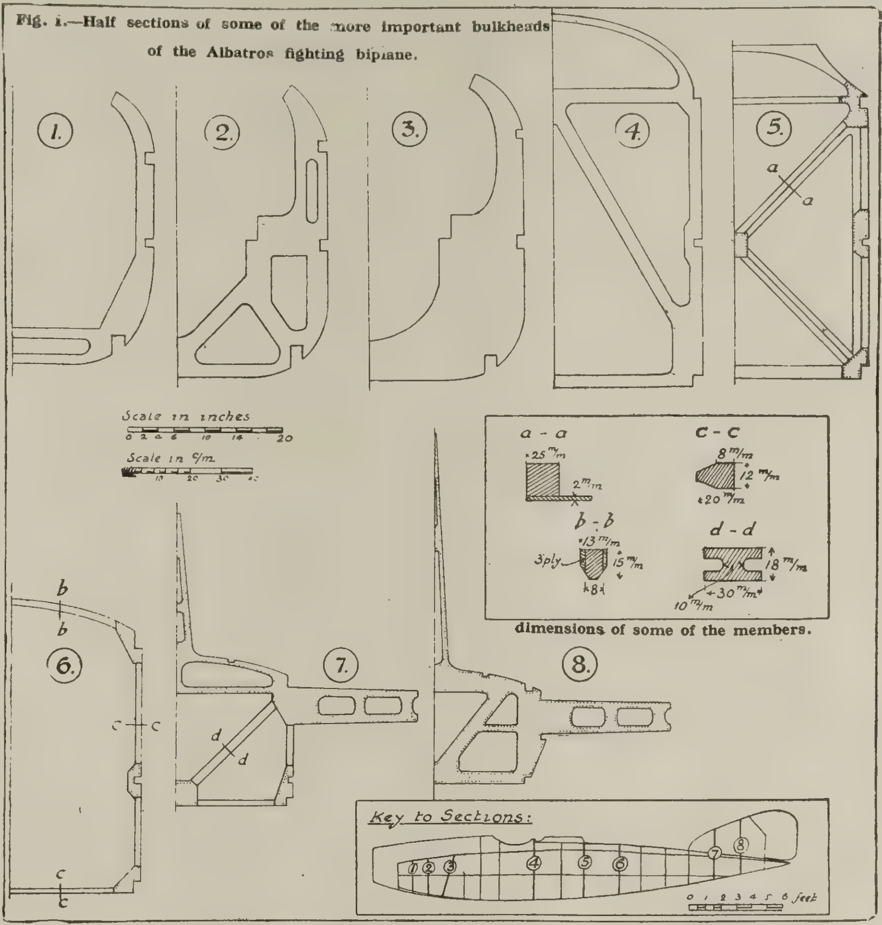
were justified in concluding that the bending resistance of the veneer type of body is greater than that of a cross wired fuselage of the same weight, although no actual figures were given showing how much greater.

When looking into the detail construction of the Albatros body the first thing that impresses one, apart from the absence of internal cross bracing, is the extensive use that has been made of veneer in the construction of the transverse bulkheads or formers, which take the place of the struts and cross members of the girder type of body. In Fig. 1 are shown the different bulkheads of the body, with dimensions, etc. The rail half-way up the sides of the body is placed parallel with the propeller shaft, thus serving as a datum line from which to make measurements of distances and angles.

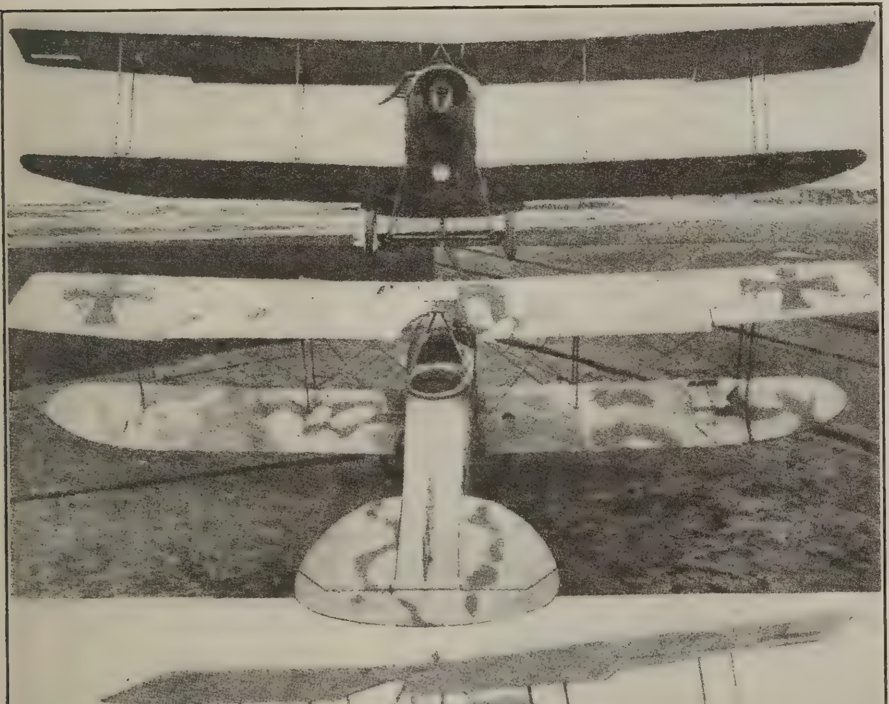
In order to enable our readers to better form a conception of the Albatros construction we have shown, in Fig. 1, half-sections of the more important and representative bulkheads. In the front portion of the body the bulkheads, which here have to take the weight of the engine, are about 1¼ in. thick, and are made up of a number of laminations of wood, which are, of course, so placed in relation to one another that the grains of adjacent layers run at angles to one another. It was further noticed that in making up these bulkheads whole sheets of the different woods were not always employed. On the contrary, many of the layers appear to have been shouldered or spliced, being made up of comparatively small pieces. It is possible that this has been done with a view to utilizing pieces of wood that would otherwise have had to be scrapped. On the other hand, it may have been done to increase the amount of crossing of the different grains. In any case, it would appear to serve both purposes, although one would expect the time taken in manufacture to be somewhat increased by such careful fitting together of small pieces of wood.

Fig. 2 shows the nose of the Albatros, and clearly indicates the method of supporting the engine. The first bulkhead, it will be seen, is solid, and is at right angles to the propeller shaft. The second bulkhead—2, Fig. 1—is lightened by piercing as shown, and is also vertical, while the third engine support is formed by a solid bulkhead—3, Fig. 1—which slopes back so as to support the front chassis struts and front cabane struts at its lower and upper ends respectively. As the front engine support is clearly shown in the sketch, Fig. 2, it has not been included in Fig. 1. The bulkhead numbered 1 in Fig. 1 is merely a former, and does not help to support the engine bearers. These are of I-section spruce, and have plywood flanges top and bottom as shown in Fi.g 3. The upper flange is continued outwards to the middle longeron so as to form a shelf or bracket at the sides of the engine.

Fig. 1.—Half sections of some of the more important bulkheads of the Albatros fighting biplane.



dimensions of some of the members.



Three views of the Albatros "CV" Fighter.

A construction somewhat different to that of the engine supports is employed in the panel between the pilot's and gunner's cockpits. This consists (4, Fig. 1) of a spruce framework faced each side with 3 mm. three-ply, the whole having a thickness of 26 mm. (about 1 in.). Behind the gunner's cockpit is a light partition built up as shown in 5, Fig. 1. Two light spruce struts run diagonally across from corner to corner of the body, crossing in the center of the fuselage at which point they are reinforced by three-ply facings and triangular blocks glued into the corners.

Their attachment to the upper and lower body longerons is of a similar construction, and will be clear from the diagram. On their front faces these diagonal struts are provided with a 2 mm. flange to stiffen them against buckling. A canvas curtain is secured to the front of this partition, having in it pockets for maps, etc.

From this point back to the front where the tail plane and vertical fin are attached the formers of the body are in the nature of a very light framework of thin struts, a typical one being shown in 6, Fig. 1. The general construction and some of the dimensions of the various members will be clear from the illustration.

One of the features in which the present Albatros differs from previous types is the construction and attachment of the tail plane and vertical fin. The latter is covered with three-ply, and is made integral with the body, out of which it grows, so to speak. The construction is shown in 7 and 8, Fig. 1, and in the perspective sketch, Fig. 4. The tail skid is supported on one and sprung from the other of these two bulkheads, as illustrated in Fig. 5 (see page 227), the general and detail construction of it being evident from the sketches. The tail plane is provided with hollow spars which fit over cantilever beams integral with bulkheads 7 and 8, Fig. 1, the details of which arrangement will be dealt with later.

Having dealt with the bulkheads or transverse partitions of the Albatros fuselage, the longitudinals rails will be considered next. These are of a somewhat complicated nature, varying as they do along their entire length, not only as regards being tapered from front to rear, but also in the different form of spindling out employed at the various points, and in the method of reinforcing with other strips of wood, partly in order to increase their strength where required and partly to make their overall section conform to the various angles and curvatures of the outisde three-ply covering of the fuselage.

From Fig. 6 a fairly good idea may be formed of the shape and dimensions of the longerons at various points. The lower one (left hand) is originally of rectangular section, but is lightened from point to point by various forms of spindling and stop-chamfering. Thus at the point B (see key, diagram Fig. 6), the inner face of the bottom longeron is spindled out on its inner face with a curved cutter. At other points of this longeron farther towards the stern various sections are met with, as channel, solid rectangle, and L sections of various proportions. Between the horizontal stern post and the point at which the middle longeron meets the lower one, the latter is reinforced with a triangular section strip, so as to carry the three-ply covering into the sloping side. Similarly at the section A, Fig. 6, the longeron, which is here of solid rectangular section, is reinforced on the outer side with a curved trip, spindled out externally, and with a smaller strip on the lower face of the longeron. This is done partly to strengthen the longeron, which at this point is subject to an increased compressive load, owing to the overhung engine, and also to afford attachment for the three-ply covering, which at this point changes from flat sided to rounded section where the sides gradually merge into the truncated cone of aluminium which forms the extreme nose of the body proper *i. e.*, at the point just behind the "spinner" on the air screw boss.

The upper longeron, which is originally of rectangular section, is spindled out to channel and L sections at various points, as shown in X, Y, Z, Fig. 6. So as to form an attachment for the curved top of the body, the top longerons have glued to their upper face additional strips of triangular section while at the point Y, Fig. 6, the section is left rectangular so as to form a support for the gun ring. In addition to their function as strengthening members these strips serve the further purpose of preventing the bulkheads from sliding along the longerons, as they are cut off where a bulkhead occurs, against the front and rear sides of which they abut. In some places, as for instance in the front of the body where the covering is in the form of an aluminium cowl over the engine, the strips are omitted and the cowl attached to turn-buttons as shown in the sketch Fig. 7. At such points the bulkheads are prevented from sliding along the longerons by a long wood screw passing horizontally through the longeron into the bulkhead.

The middle longerons, which, as already pointed out in a previous article, are horizontal, *i. e.*, parallel to the propeller shaft, are of smaller overall dimensions than are the four main longerons. They are rectangular section, lightened in places by stop-chamfering, as shown in *a* and *b*, Fig. 6.

(*To be continued*)

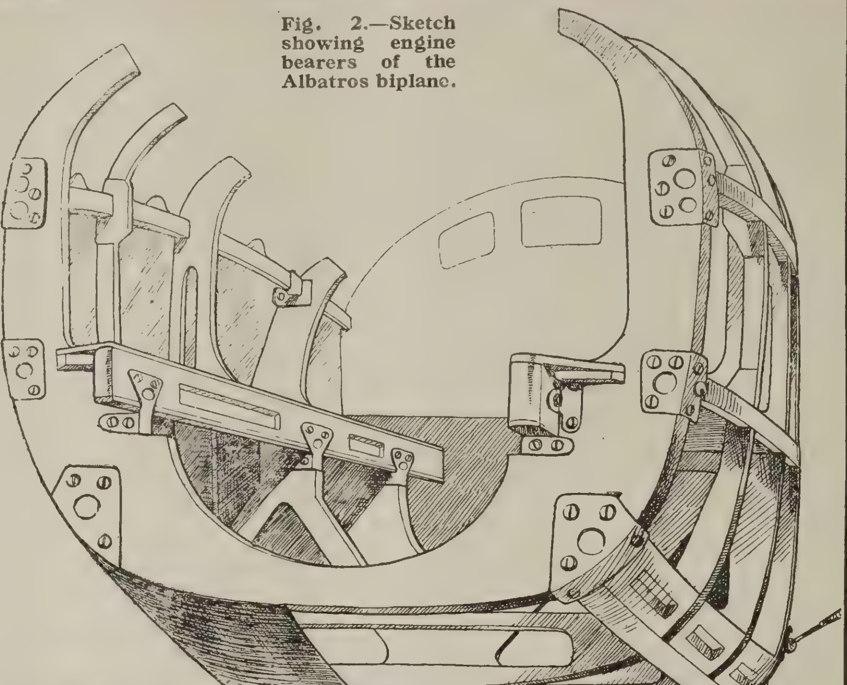


Fig. 2.—Sketch showing engine bearers of the Albatros biplane.

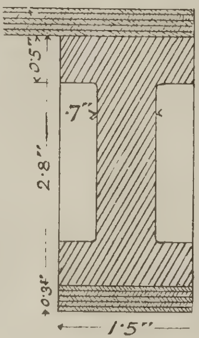


Fig. 3.—Section of the engine bearers of the Albatros biplane.

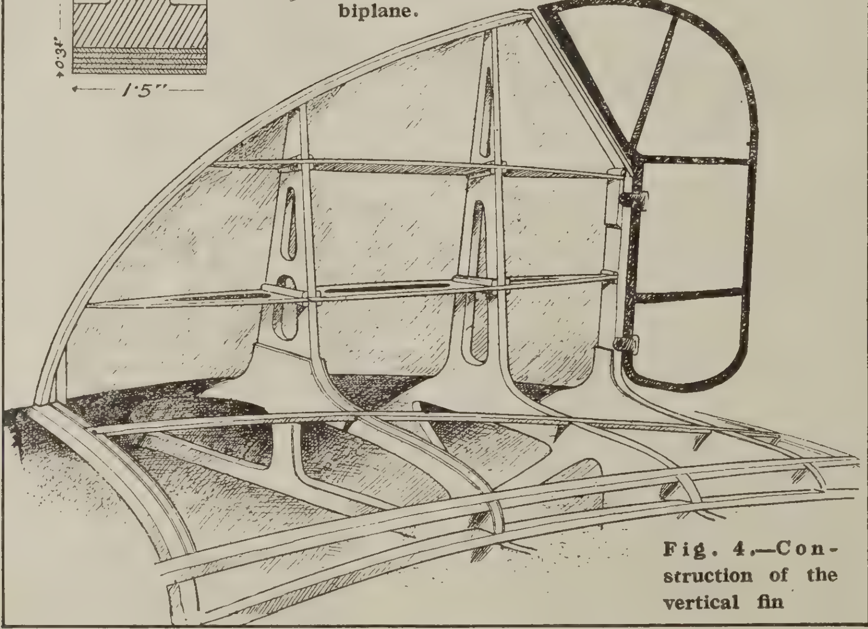


Fig. 4.—Construction of the vertical fin

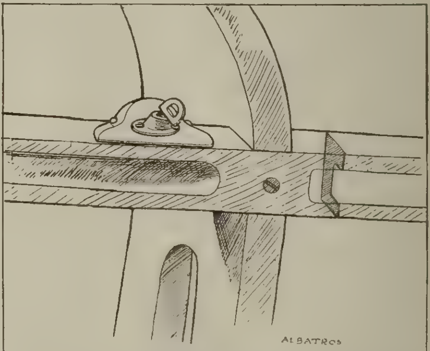


Fig. 7.—Sketch showing turnbuttons securing engine cowl to upper *longerons*. The bulkhead is prevented from shifting by a wood screw going through the *longeron* into the bulkhead.

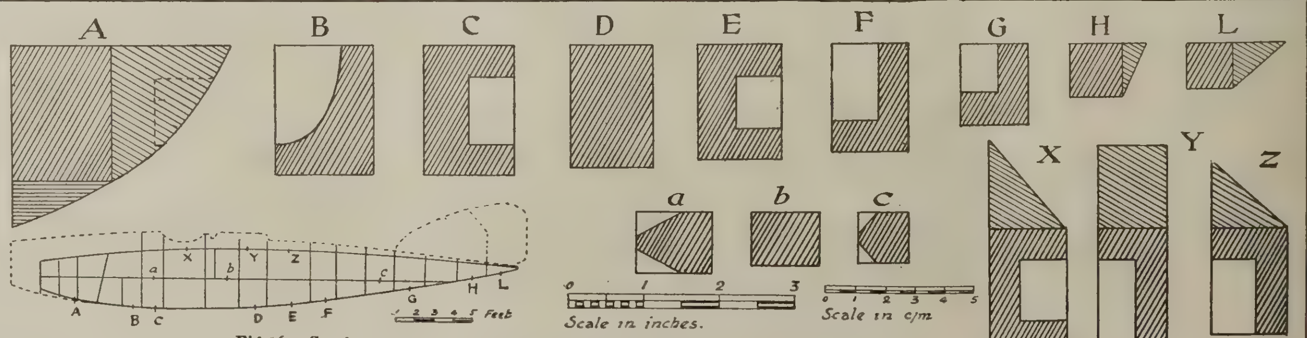


Fig. 6.—Sections and dimensions of the *longerons* of the Albatros biplane.

BUREAU OF STANDARDS TEST AVIATORS' GOGGLE GLASS

THE Bureau of Standards recently completed a series of tests on non-shatterable glass suitable for aviators' goggles. The following is the official report:

Nature of Report

"This report deals principally with the so-called non-shatterable glasses intended to protect the eyes from splinters when accidents occur which fracture the glass used in spectacles, aviator goggles, face masks, windshields, etc.. Some of the optical properties such as transparency and distortion will also receive consideration.

Description of Material

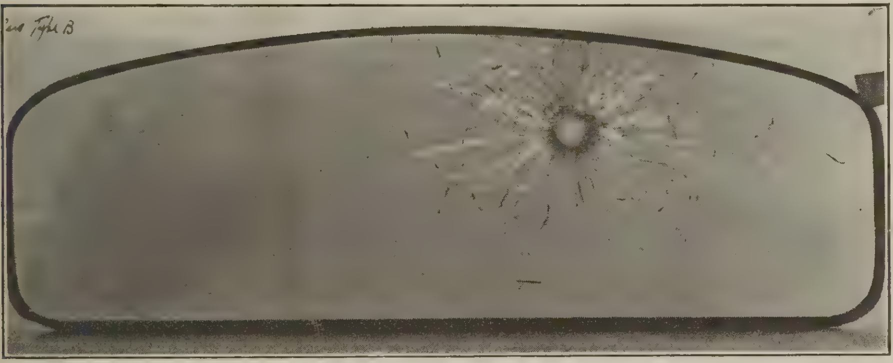
"The material covered in this report consists of two types of protected glass in one of which (A type) the glass has one side covered with a layer of celluloid, and in the other (B type) a layer of celluloid is sandwiched between two layers of glass.

Plan of Investigation

"Comparative values of the dynamic strength and shatterability of the glasses were obtained by subjecting the glasses to sudden shock or impact either by dropping a steel ball on the glasses or by shooting a bullet at them.

Test No. 1

"The glass was fastened on top of a block of wood covered with ¼-inch rubber with a 1½-inch hole in the center. A steel ball weighing 4 ounces was dropped on the surface of the glass from increasing heights until rupture occurred and then *additional blows* were delivered from this last height until the glass was powdered.



Result of 30 caliber bullet with muzzle velocity of 2700 ft. sec., fired at Type B Resistal glass at distance of 25 yards. See report.

Results

[In the tables here presented the initials S.B. represent test samples submitted by Strauss & Buegeleisen, New York; G.F. samples by Glass Founders' Corporation; and S.G. samples of Triplex.—EDITOR.]

Glass No.		Thickness inches	Height for rupture inches	Extra blows
1	S.B.	0.150	7.5	60
1	S.B.	0.150	14.5	16
2	S.B.	0.131	10.0	10
2	S.B.	0.150	10.5	10
3	S.B.	0.109	6.0	50
4	S.B.	0.100	7.0	14
5	S.B.	0.106	6.0	28
6a	S.B.	0.103	6.0	50
6a	S.B.	0.117	9.2	30
7	S.B.	0.114	9.0	10
7	S.B.	0.113	8.0	25
7	S.B.	0.100	6.2	42
8	S.B.	0.147	19.0	3
8	S.B.	0.140	14.0	3
8	S.B.	0.131	12.0	100
8	S.B.	0.131	12.5	15
9	S.B.	0.116	11.5	1
10a	S.B.	0.100	7.0	60
10a	S.B.	0.093	6.0	16
10a	S.B.	0.130	8.0	55
1	G.F.	0.080	5.5	12
3	G.F.	0.100	5.5	35
1	S.G.	0.100	5.0	100
2	S.G.	0.104	5.0	100
3	S.G.	0.100	6.5	50

All the glasses listed above are of type B except those designated G.F., which are type A. The fracturing blow developed many cracks radiating from the point of impact, but the lens as a whole remained intact and lost no splinters.

"The last column shows the number of blows required to powder the glass above the celluloid film. The B type glasses, in general, lost no splinters from the rear surface until the front surface was completely shattered and the steel ball struck the intervening layer of celluloid. Column 4 there, represents the number of blows delivered to the B type glasses before splinters flew from the rear of the glass.

"The A type glasses lost no splinters from the under surface, as this surface was the one covered with celluloid.

Test No. 2

"A 30-caliber bullet with a muzzle velocity of 2700 ft. sec was fired from a distance of 25 yards at a target supporting the glass. Plates of glass (about 4 x 10 inches) were held firmly against rubber strips on the target.

Results

"Type A glasses received a ragged hole and were so badly shattered over the entire area that vision through the glass was greatly impaired. Although the celluloid film continued to hold most of the pieces of glass together, very little rigidly remained in the plate.

"A bullet passing through type B glasses made a clean cut hole and produced numerous irregular cracks in each of the sheets of glass separated by the celluloid. These cracks were confined to a circular area of about 2 inches radius and the remainder of the plate remained practically uninjured. The cracks in the two plates of glass separated by celluloid in general, followed different directions, and did not register. The fact allowed the laminated plate to retain considerable rigidity even after it had been punctured. All the glass except a small area immediately around the bullet hold was firmly held by the celluloid.

"Ordinary plate glass, without celluloid covering, when struck by the bullet, flew into innumerable pieces and became a complete wreck.

"The effects of bullet penetrations on types A and B glasses are shown in the attached photographs.

Conclusions

"Glasses of type A, with an exterior coating facing the eyes, will protect the eyes from glass splinters unless the coating is ruptured. A coating of celluloid, however, is very unsatisfactory for several reasons.

"The samples examined were not evenly coated, and distorted vision a great deal, especially near the edges.

"Celluloid is comparatively soft and would soon lose much of its transparency if exposed to weathering and scratching.

"Glasses for spectacles, goggles, and face masks, should be of material which may be sterilized by immersion in boiling water. Such treatment makes celluloid opaque and also removes it from the glass plate.

"If satisfactory coating substances can be found, such covered glass should be of value in shielding the eyes and face from splintering glass.

"Laminated glass, or type B, when made with good glass, produces very little distortion.

"Glass plates on either side of a transparent layer of binding material protect this material from weathering or scratching. Celluloid, however, is not a very satisfactory substance to put between glasses. Unless the edges are permanently sealed, such glasses are apt to be discolored or ruined by immersion in sterlizing baths. Some of the samples reported on above had sealed edges, but the seals were not highly resisting or permanent.

"The transparencies of type B samples which were actually measured were found to be only fair. From 80 to 86 per cent of the total incident light was found to be transmitted by these glasses. Better quality glass and a more transparent inter layer would reduce the absorption of light.

"The relatively increased non-shatterability of laminated glass and its comparatively good transparency and rigidity even after puncture, give it great importance in devices for protecting the eyes and face."

To End Profiteering in Officers' Equipment

A bill is under consideration of the House Committee on Military Affairs providing for the sale of army officer's uniforms at cost price. Tailors and uniform makers have been overcharging, so that the cost of the required equipment greatly exceeds the allowance made to officers tor the purpose. The elimination of this form of profiteering will be welcomed, and if the increased cost of materials accounts for the very materially increased prices of clothing their sale by the Government will very likely result in raising the allowance to officers for the purchase of uniforms and equipment.

Another form of profiteering—that of unduly raising the rent in districts where Government employees are forced to reside by the nature of their duties—is also to be eliminated by a bill now in the hands of one of the Congress committees.

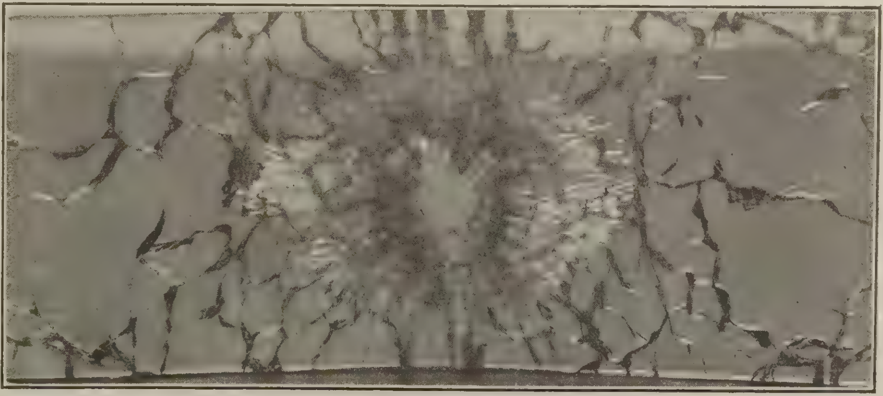
England and America

For their respective first three months in the American War Savings Campaign is running ahead of the English campaign. America is pouring into the Treasury at the rate of about $2,000,000 a day—over $75,000,000 up to date.

The direct comparison is:

	England	*America*
First month.........	$5,172,000	$10,236,451
Second month.......	2,719,000	24,559,722
Third month........	3,402,000	41,148,244
Total	$11,293,000	$75,944,417

The $75,944,417 of spending already put at the service of the Government by the buyers of war savings securities has transferred from millions of patriotic saving citizens to the National Treasury command of the labor and materials to build a fleet of about on hundred 5,000-ton ships.



Result of 30 caliber bullet with muzzle velocity of 2700 ft. sec., fired at Type A glass at distance of 25 yards. See report.

ENGINE WEIGHT

By F. W. LANCHESTER

It is commonly a fact that in order to obtain the highest possible fuel economy the weight of a petrol motor requires to be made greater than when economy is sacrificed. A question with which the aeronautical designer or constructor is frequently faced, in the adoption of an engine to form the basis of his design, is whether, for a given time or distance to adopt a light-weight engine having perhaps not the best possible fuel economy or a heavier engine in which the fuel consumption per h.p. hour is less.

The writer believes he was the first to make use of the now well-known h.p. weight diagram in which abscissæ represent hours of light and ordinates the gross weight of engine plus fuel and lubricating oil (Fig. 1). In such a diagram (Fig. 1, which is taken from the first report 1909/10 of the Advisory Committee for Aeronautics) it will be seen how the graph for the lighter engine, such as the Gnome, with its heavy consumption of petrol and lubricating oil, crosses the graph of one of the heavier and more economical engines at some definite point representing a certain number of hours' work at full load; when applied to the aeroplane this may be taken as some definite number of hours' flight. For military purposes it is common practice to-day to specify some definite period of flight and to give the weights of engines plus fuel, plus lubricating oil corresponding thereto; this, on the diagram, Fig. 1, is equivalent to reading the fuel values for some definite abscissa (time value) on the ordinate scale. In Fig. 1, for example, taking four hours as time of flight, the figures for the various engines given were (in 1909) as follows:

Gnome 50-h.p. (Aero Engine)	7.5
Antoinette (Aero Engine)	9.1
Renault 70-h.p. (Aero Engine)	10.3
Daimler 38-h.p. (Motor-car Engine)	12.3
Daimler 22-h.p. (Motor-car Engine)	13.0

In order to construct a diagram such as Fig. 1 we require to know the weights of the engines without fuel or lubrication, and the rate of consumption in each case. Alternatively, if the weights without fuel or lubrication be given, and the weights for any definite number of hours' flying, the diagram may then be immediately laid out. It will be seen that the diagram is the preferable method of comparing two engines, inasmuch as the performance for any given hour period may be compared, and is visible at a glance.

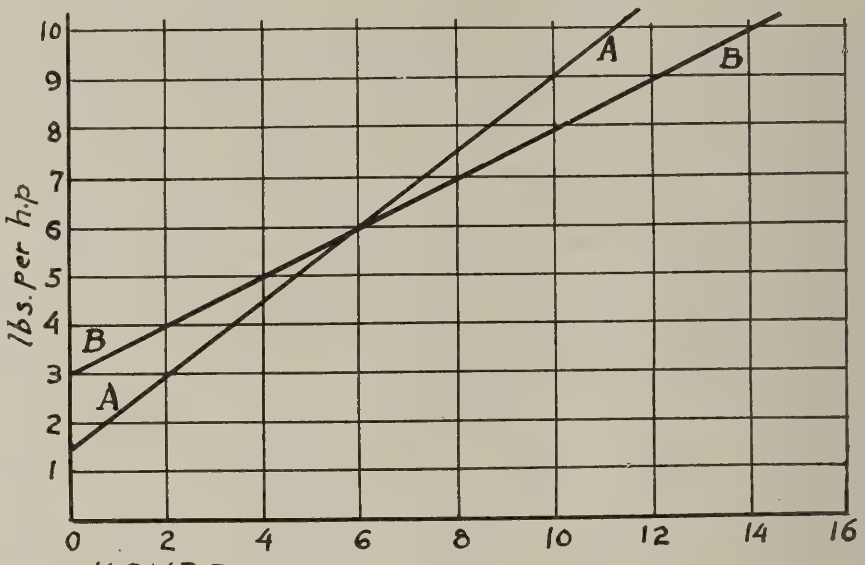


Figure 2

The object of the present article is to call attention to the results obtained if, in selecting an engine as suitable for given duty, circumstances other than that of aggregate weight, as represented by the diagram, be left out of account. There has, in my opinion, been too great a tendency to discuss the question of engine suitability from the point of view of aggregate weight alone, and to reply too implicitly upon the bare figures to the neglect of other considerations which are of no less importance. The plain and unvarnished fact is that to judge engines on their augmented weight, as given, for example, by Fig. 1, is equivalent to considering the performance of the aeroplane to which the engine is applied as that proper to it *when leaving its aerodrome*, or the starting-point of its flight, apart from its performance, probably some hours afterwards, when it is engaged with an enemy, or occupied in pursuing or evading pursuit. It is also no less important to consider the condition when the flight is over and when alighting.

When we remember how much importance attaches, in the design of a machine as a whole, to its permissible alighting speed, we realize how serious the neglect of this latter condition may actually be.

As a comparison and contrast let us take the imaginary case of two engines of 200 h.p. In case *A* let us assume that the engine weight be 1.5 lb. per h.p., and in the other case let it be 3 lb. per h.p., and let us assume that in case *A* the petrol and lubricating oil consumption be 0.75 lb. per h.p. hour, and in case *B* let it be 0.5 lb. per h.p. hour. Then on a comparison basis of six hours' flight we have the account as follows:

A.		B.	
Engine weight.	300	Engine weight.	600
Fuel weight....	900	Fuel Weight....	600
	1,200		1,200

Total—1,200 lbs. in each case.

Now, on the basis of the diagram, Fig. 2, these two engines are on terms of equality. What are the actual facts if two similar machines be fitted with engine *A* and engine *B* respectively? On their leaving the aerodrome (assuming propeller efficiencies, etc., the same) their performances, speed, rate of climb, etc., would be identical; but let us imagine that both, after two hours' flying—one-third of the whole period—to be engaged with the enemy. Aeroplane *A* has consumed 300 lb. weight of petrol, aeroplane *B* has consumed 200 lb. weight. *A* is 100 lb. lighter; its flying speed, its climbing capacity, and its height of ceiling will all be correspondingly benefited, and between the two machines in the air there will be no question as to which is the superior.

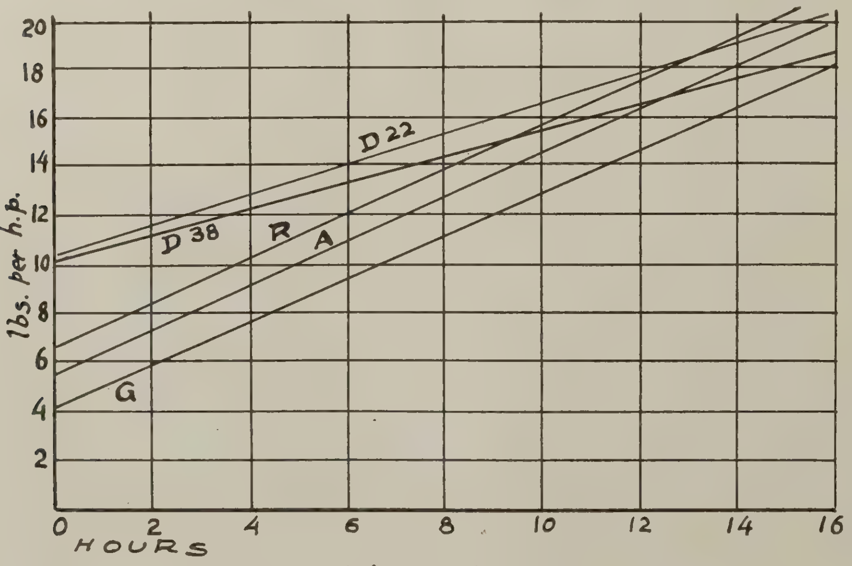


Figure 1

I have heard many men, who affect to take a practical view of the subject, say that as far as performance goes you cannot detect, in an aeroplane of, say, 25 cwt. or 30 cwt. gross weight, a difference of 20 lb. more or less, and who rather pooh-pooh weight save as being carried to an unnecessary point. It is certainly strange that such views should require answering, but in view of the quarters in which I have heard such opinions expressed, they certainly cannot be ignored. There are two lines of argument to convince that superior type of person who calls himself "practical." Parenthetically, it may be remarked that the man who boasts of his knowledge being "practical" is rather like a girl who, having an ugly face, says: "Look at my beautiful hair," when, after all, her hair is nothing out of the ordinary; or like the man who, having been born a cripple with no right arm, is very self-satisfied because he can manage to put his food into his mouth with his left hand. His peculiarity is not commonly any surfeit of practical ability, but an absence of theoretical training and of all capacity for exact thought.

One answer is that although 20 lb. cannot be detected in the performance of an aeroplane, *several 20 lb. items can*, which all goes to prove, not that 20 lb. does not matter, but that an aeroplane considered as a weighing machine is not an instrument of precision. Another answer which perhaps will appeal more to the "practical" man is that if a machine weighs 20 lb. less without sacrifice of structural strength, engine power, or any other of those things which count in its performance, then it can carry 20 lb. more of ammunition, bomb weight, or whatever it needs.

If, then, we consider the fighting machine we must be prepared to admit that the comparison between engine and engine must not be made with the full load of petrol for the flight period specified, but rather upon its average condition, when it may be presumed to be engaged with an enemy.

Commonly, it would be fair to put it that the criterion of engine weight for such duty should be about half the full fuel load and not the full load as has been too generally assumed. In other words, referring to Fig. 2, if the period of flight for which fuel and lubrication capacity is provided (and which is in contemplation) be six hours, the criterion on which the weight of the engine should be judged should be a period of three hours, and if the period be four hours the criterion period should be two hours. In the event of the straight-line graphs representing the two engines in question, intersecting between the half-flight period and the full-flight period so defined, the point of view taken in the present article would result in a reversal of the decision as to which engine is the most appropriate.

When we deal with the bombing aeroplane the same considerations apply with equal force, for the bombing machine would commonly have its roughest time with the enemy when nearing its objective, and when, say, one-third of its petrol has been consumed; and after leaving its objective, also during its return its height of ceiling and its speed of flight will be important factors in enabling it to get home without molestation.

But these purely military considerations are not alone. As already stated, the question of land speed is one of great importance. Here we may for all intents and purposes assume that the power weight factor of the engine itself is all that counts. It is true that there will always be a small reserve of fuel and lubricating oil at the finish, but this may, at a pinch, be jettisoned, and in any case it may be neglected for the purpose of discussion. Alternately we may assume, as a concession to the point, that the weight taken comprises half an hour's petrol and fuel supply. We know that the whole design of an aeroplane hinges on its alighting speed. If once the alighting speed is prescribed, a superior limit is set to the speed of least resistance, and the resistance graph is determined. The maximum speed of flight, then, is when the thrust line cuts the resistance graph. Without any advance in engine design this maximum will be increased if a higher alighting speed be permitted. The point under discussion is that if we take the admittedly extreme example of the two supposed aeroplanes *A* and *B*, when these are alighting after exhausting their petrol, aeroplane *A* weighs 300 lb. less than aeroplane *B*; 300 lb. may be taken as 10 per cent of the total weight, and will permit of a 5 per cent lower alighting speed, other things being equal. Consequently, machine *A* may be designed on the basis at full load of a 5 per cent higher alighting speed. Thus, disencumbered of its fuel, its alighting speed will be the same as aeroplane *B* in like condition. Under these circumstances the lighter-weight engine, relatively extravagant in fuel, although apparently on terms of equality from the point of view of total gross weight, will be in every way superior, machine for machine, to the heavier type. The lighter engine will give the designer scope to produce a machine outpointing the other in every important respect.—Courtesy *Flying* (London).

(*Continued from page* 206)

Long, Carl Cleveland	SLR; EOT
Langley, John Arthur	SLR; RWT
Lowry, Hal M.	SLR
Lautz, Theodore V. V.	SLR
Lawyer, Samuel E.	SLR
Littlefield, Henry M.	SLR
Lomax, Thornton G., Jr.	SLR
Lucas, Philip D.	SLR
Lewis, Chauncey G.	SLR
Lee, Bernard W.	SLR
Luce, Raymond P.	SLR
Liles, James F.	FLR
Lowry, Swift M.	SLR

M

McLellan, Hiram J.	SLR
McCall, Carlton C.	SLR
McCormack, Nelson C.	AGC
Magee, David W.	SLR
Martin, Howard C.	SLR
Moisant, Stanlie J.	SLR
Menagh, Ray Chidester	SLR; BST
Morrissey, Raymond Addison	FRF
Murray, Thomas H.	SLR; KST (2)
Meenan, John J.	AGC
Mills, Harold P.	AGC
Morison, James Currie	SLR; PMT
Miller, Hyman S.	PRC
Moore, Edwin C.	FRF
Meyer, Herbert Alton	CPR; CMV
Mills, Harold W.	SLR; FOB
Morse, Charles L.	SLR; DIK; FRF
Milliken, William M.	PMT
Marvin, Walter S.	GIT
Manning, James F., Jr.	FLR
Matthews, William	FLR
Morris, Wistar	FLR
Mason, Ernest J.	SLR
Massey, Raymond R.	SLR
Metcalf, Arthur B.	SLR
Mitchell, Raymond A.	SLR
Montague, Alfred A.	SLR
Moore, William E.	SLR
Mumby, Earl M.	Note 4
Moses, Lester Ezra	SLR; DIK
Moore, Herve Charles	SLR; GLC; FRF
Miller, Bennie Alva	SLR; KST
Merrick, Louis M.	DIK
Morris, William C.	SLR
Morgan, William V.	SLR
Mackie, Norman S.	AGC
Moore, Edwin Cecil	SLR; TFT
Morsbach, Robert E.	FRF
Merritt, Harold D.	FRF
Miller, Walter B.	SLR
Menefee, Jesse I.	SLR
Meyer, Charles F.	SLR
Monteith, Charles N.	SLR
Moon, Charles M.	SLR
Mullineaux, Lester R.	SLR
Misfeldt, George W.	SLR
Munroe, James S.	SLR
Murphy, John P.	SLR
Moore, Charles F.	FLR
McCollough, Charles B.	HHN
McCormack, Victor A.	SLR
McFeely, Joseph	SLR
McKenzie, Robert R.	SLR
McMahon, Michael J.	SLR; KST
McPeak, Norman B.	DIK
McCormick, John B.	SLR
McGraw, John E.	SLR
McCrum, Richard Douglas	SLR; KST
McKinney, Edward C.	Note 8
McDevitt, Lester William	SLR; KST
McKnight, James Albert	SLR; EOT
McArthur, Emmett K.	SLR
McHenry, Arthur J.	SLR
McCormick, John F.	FLT
McCormack, Francis H.	SLR
McGinely, John J.	SLR
McMahon, Philip John	SLR; KST
McCune, Milo	SLR; KST
McMullen, Clements	SLR; KST
MacLaughlin, Thomas G.	SLR
MacFadden, Willford, Jr.	EOT
MacDonald, Eugene	SLR
Marsh, Albert Ernest	SLR
Meinzer, Fred Henry	SLR
Merrill, Keith Bartlett	SLR
Montgomery, James Evans	SLR
Meyer, Adolph H.	SLR
Murphy, Edward J.	SLR
Mortimer, Richard, Jr.	FLT
Matthews, George B., Jr.	SLR
Merrill, Leland H.	SLR
Mann, Walter L.	SLR
Mayer, Walter J.	SLR
Morgan, Paul Victor	SLR
Murphy, Gerald Clery	SLR
Merrill, Carlton Horne	SLR; KST (2)
Messner, Arthur William	SLR; KST (2)
Miller, Clarence Lysle	SLR; KST (2)
Moore, Robert Shields	SLR; KST(2)
Mitchell, Raymond A.	PFO
McDonald, Benjamin Franklin	SLR; KST (2)
McGuire, John	FLR
McCrum, Richard D.	SLR
McCune, Milo	SLR
McDevitt, Lester W.	SLR
McKnight, James A.	SLR
McMullen, Clements	SLR
McMahon, Philip J.	SLR
McMahon, Michael J.	SLR; PFO
Miller, Bennie A.	SLR
Mills, Harold W.	SLR
Moore, Heve C.	SLR
Morison, James M.	SLR
Moses, Lester E.	SLR
Martin, Howard C.	PFO
Menagh, Ray C.	SLR
Murray, Thomas H.	SLR
Meredith, George Wise	CDT
MacMichael, John H., Jr.	SLR
McCurdy, John A.	SLR
McDonnell, Edwin A.	SLR
McClure, Colin B.	SLR
McParland, Norman D.	SLR
MacDonald, Neil C.	SLR
McCoy, John W.	SLR
McPeak, Norman B.	SLR
McWhorter, Ray S.	SLR
Malmgren, Carl E.	SLR
Markham, Robert B.	SLR
Martin, Charles J.	SLR
Mahnken, Walter R.	SLR
Mansfield, John C.	SLR
Mohrman, Louis G.	SLR
Murray, John J.	SLR
Mahler, Herbert P.	SLR
Maurer, William R.	SLR
Mellor, Lloyd E.	SLR
Meyer, Lester Lewis	SLR; RSD
Mader, Luther Philip	SLR; KST
Marshall, Wilson, Jr.	SLR; AGC
Morrissey, Raymond Addison	SLR; GLC
Mandel, Oscar	SLR; TFT

N

Noble, Gordon G.	CPR
Norton, Alwin W.	SLR
Nichols, Brayton	SLR; EOT
Nason, Arthur Lyndon	SLR; KST
Nelson, William Thomas	SLR; KST
Nelson, Fred C.	SLR
Neely, Forest Hunter	SLR; EOT
Nolan, Edward J.	SLR
Noble, Gordon Granger	CPR; CSO
Norton, Alwin Wood	SLR; DIK
Nelson, Thomas E.	SLR
Neigarth, Omer O.	Note 6
Nitchke, Hilliare F.	CSO
Newman, Robert E.	SLR

(*Continued on page* 221)

INDUSTRIAL DEPARTMENT

AEROPLANE CONSTRUCTION IN QUEENS

By FRANK E. BREYFOGEL

Industrial Manager, Chamber of Commerce of the Borough of Queens, N. Y. City

IN the Borough of Queens section of New York City, there are today 14 aeroplane and closely allied manufacturers at work on the production of finished planes for the government—engines, planes, propellers, bearings, moto-meters, aviaphones and other accesories. In addition there is one of the largest construction laboratories in the United States in which new models of war type aeroplanes are developed for the government under contract. An aeronautic station covering 100 acres is also established in this important section of New York City.

First Firm in the U. S. to Produce Rotary Engines

Long before the declaration of war by the United States, a firm in the Borough of Queens was manufacturing the rotary type aeroplane for the Allies. It was the only firm then doing such work and still remains the only one in the United States today.

Probably the experience and ability of this firm in the production of so intricate a type of mechanism with the necessary high-class labor that is required for such work is one of the potent reasons why the Borough of Queens has developed into an aeroplane production center.

It is common knowledge that when Great Britain entered the war, they found themselves under the weight of a veritable avalanche of orders calling for Gnome engines for the British air fleet. They turned to the United States, and although the specifications for manufacture were most exacting, one American concern in Queens Borough undertook the work and secured the rights to build and sell the Gnome and the Le Rohne engines.

It proved that the manufacturer of this type of engine, the most difficult of all aeroplane engines to produce—has been a successful enterprise in America. A large proportion of the pursuit planes and speed scouts that are used on the firing line on the European battle front, are equipped with the rotary engine.

Manufacturing Complete Planes

One firm in the Borough of Queens is and has been since making scout planes and has just begun the production of flying boats. While this plant now covers 75,000 square feet of floor space employing 600 men and producting on the average of 5 planes per week, an additional 200,000 square feet is now being constructed to be completed April 15th. When the addition is completed this firm expects to employ about 2,000 men and to at least triple their output.

Another concern is producing graduate training biplanes and equipping them with 160 H. P. motors.

Propeller Production of a High Order

A large producer of propellers has established a factory in the Borough of Queens employing 100 men and turning out at the present time propellers probably equal in number to the other propeller factories in the United States, in spite of the fact that at times they have had from 25 to 30 different types of propellers going through the factory at the same time. Propeller building includes the ability to design special work suitable for the very numerous types of machines which have been offered to the government for test purposes, as well as to meet a further condition, namely, the almost equally numerous types of motors.

The experience of this factory in locating in the Borough of Queens is interesting and is incorporated in the following statement of its president:

"It was no easy task last summer to locate a suitable factory for the purpose of manufacturing propellers. It was not until the middle of October that we finally moved into the building now occupied. Special machines were required, special tools. Anyone who in the last eighteen months has attempted to equip even a small plant will realize the cost of this in both time and money.

"The Borough of Queens has proved an excellent labor

The Borough of Queens offers many advantages to the aeroplane industry.

market with good delivery and shipping points. The local concerns who have been called upon to aid in the supply of material have given their full cooperation."

Other firms are engaged in the manufacture of propellers for the Government though the latter are not devoting their entire organization to this production alone.

Construction Laboratory in Queens Borough

One of the largest construction laboratories in the United States in which new models of war type aeroplanes are developed for the Government under contract is established in Queens Borough. This company has taken the customary type of aeroplane construction and very greatly reduced its weight, thus enabling the same machine to carry greater load or to make a higher speed. They have taken machines that were of very little use for military operations and so decreased the weight by improving construction, that instead of carrying one person they can now cary two, together with greater fuel and an increased number of bombs. This company now has contracts with the Army and Navy for advanced types of other machines.

They are working on the principle that simplification of construction is a function which calls for the highest engineering skill. They established their headquarters in the Borough of Queens because:

1. Of the availability of the highest type of skilled mechanics.
2. Because of the proximity to the port of shipment of the finished product overseas.
3. Because of the proximity of the Mineola flying grounds which are conceded to be among the best in the country.

Curvature of Planes Being Improved

Another concern established in Queens for a period of years is doing important experimental work, especially on the improvement of the curvature of the planes.

Motometers—Mahogany—Enameling and Japaning Plants

Besides the factories producing engines, planes, and propellers, there are allied industries which are of distinct advantages to the above-mentioned manufacturers. Four large mahogany importers and manufacturers are established here who can supply this necessary wood for the manufacture of propellers. Another company manufactures the aviaphone, which makes conversation possible between the pilot and the passenger, permitting the direction of the pilot for scouting and is especially useful in making maps and photographs because both hands are free to work.

The home of the distance type moto-meters for aeroplanes is in the Borough of Queens.

Reputed to be the largest ovens in New York State used for the enameling and japaning of aeroplane bodies and parts, is established in this section of New York City. It might be mentioned in passing also that anti-air craft guns are being made here.

Aeroplane and Automobile Industry Closely Allied

The aeroplane industry both in Europe and the United States has grown so suddenly and the need for a certain type of workmen has come into demand within so short a time that where no new factories have actually been built the tendency has been to use the automobile industries in the country for this highly specialized work.

This accounts no doubt for the existence in the Borough of Queens today of so many aeroplane industries and the operation by some of its autoombile factories in the work.

It should be kept in mind that the Borough of Queens has come to be practically the automobile center of the East, where 42 plants are engaged in the manufacture and assembling of automobiles, automobile parts and accessories with products for the year 1916 value at $37,448,000 and employing nearly 9,000 workers.

These manufacturers have built their plants here for very definite economic reasons. The same reasons apply to the production of aeroplanes.

Comparative cheapness in production, the relation of the Port of New York for export advantage, the coastwise shipping facilities, and the great rail transportation systems, give Queens Borough a unique position as a manufacturing and distributing center. It draws its labor from all parts of the enormous labor market in the largest city in the world, made quickly available by a network of rapid transit lines at a five-cent fare.

Many manufacturers have deterred from moving to New York City because of what they considered an excessive cost of factory space. This is an erroneous impression so far as Queens Borough is concerned, for in this section of New York, land is far less costly than in the older, built-up sections of the city, and still Queens Borough has all the advantages that any other part of New York City possesses. It is rapidly becoming the industrial center of New York and is today a borough of over a thousand factories.

Outstanding Advantage for Aeroplane Production

The outstanding advantages of Queens Borough for the production of aeroplanes are its location at the Port of New York, an inestimable advantage for shipment abroad, its enormous skilled labor supply, proximity to raw materials and semi-finished parts, accessibility to flying grounds on the vast stretches of Long Island.

All of these economic advantages compare favorably with any other section of the United States, but overshadowing every other advantage elsewhere is the location of Queens Borough at the port of exit of steamships to Europe. Shipment to the coast of a finished aeroplane is a difficult and expensive undertaking. Satisfactory production is possible only near a port of shipment.

Queens Borough is becoming the automobile and accessory center of the east. The production of the automobile and the aeroplane is so closely allied that they are practically inseparable.

CHATTANOOGA—A CITY OF DIVERSIFIED MANUFACTURING INTERESTS

By CHARLES W. HOWARD

Director of the Chattanooga Industrial Board

CHATTANOOGA is a city of diversified manufacturing interests,—321 manufacturers, producing 1,138 different articles, certainly give it a rather wide range. Proximity to the raw material, splendid distributing facilities has made it possible for Chattanooga in 20 years to take a front rank position with the leading manufacturing cities of the country.

Lumber, iron, coal, cotton, bauxite, barytes, limestone, and potters' clays, can all be assembled in Chattanooga on from a switching carload rate, to 50 cents per ton. With labor condi-

(*Continued on page* 222)

Two views of the city of Chattanooga, Tenn.

FOREIGN NEWS

FRANCE

Reporting operations on the western front, the French official announcement for March 28th says:

"On March 23 one of our groups of escadrilles carried out 125 patrols and 120 reconnoitering missions in the region of St. Quentin, Ham, La Fere and Noyon. More than 50,000 kilos of projectiles were dropped from March 22 to 26 on convoys, trains and enemy troop concentrations, which suffered heavy losses.

"Descending at times to within about sixty feet above the earth, our pilots attacked with machine guns enemy contingents, firing thousands of cartridges. Forty-two German aeroplanes and six captive balloons were brought down."

The official announcement of March 30th reports intensive aerial activity, as follows:

"On Wednesday and Thursday French aviators, notwithstanding the bad weather, continued their attacks against the German machines. Flying in groups the French airmen attacked the Germans with bombs and machine guns on the battle line and in the concentration zones. Several French machines made as many as three of these expeditions on the same day.

"Seventeen thousand kilograms (more than eighteen tons) of projectiles were thrown down in the regions of Guiscard and Ham. French pursuit squadrons in the course of numerous combats brought down thirteen German aeroplanes, of which seven were destroyed and six were damaged badly. Furthermore, two captive balloons were set on fire."

"Notwithstanding the unfavorable atmospheric conditions allied aviators carried out numerous bombardments along the whole front. An enemy machine was brought down in the region of the Struma," says the announcement of March 24th on the operations of the Balkan front.

GERMANY

Aerial operations in the great offensive which Germany has undertaken have assumed colossal proportions. The announcement of March 26th says:

"Since the beginning of the battle ninety-three enemy aeroplanes and six captive balloons have been brought down. Cavalry Captain Baron von Richthofen has achieved his sixty-seventh and sixty-eighth aerial victories; Lieutenant Bongartz, his thirty-second; First Lieutenant Loerzer, his twenty-fourth; Corporal Baumer, his twenty-third; Lieutenant Kroll, his twenty-second, and Lieutenant Thuy his twentieth."

Captain Baron von Richthofen, the German "ace of aces" is credited with two victories on March 27th:

"Captain Baron von Richthofen has achieved his sixty-ninth and seventieth aerial victories."

The official announcement of March 28th credits Captain Richthofen with further successes:

"Captain Baron von Richthofen has achieved his seventy-first and seventy-second aerial victories."

Captain Baron von Richthofen again is the only reference made to aerial activity, in the announcement of March 29th:

"Cavalry Captain Baron von Richthofen obtained his seventy-fourth aerial victory."

The announcement of March 30th says:

"Lieutenant Gongartz brought down his thirty-second and thirty-third opponents and Lieutenant Udet his twenty-second."

GREAT BRITAIN

Despite the gigantic effort of Germany to break down the British infantry, bombing attacks are continued by the British according to the announcement of March 25th:

"During the night one of the enemy's large bombing machines landed behind our lines. Following a successful daylight raid on Mannheim, other objectives in Germany were attacked during the night.

"Half a ton of bombs were dropped on the railway stations at Cologne, where a fire was started. Over a ton of bombs were distributted between the Luxemburg railway station, where a fire broke out, and Courcelles railway station, east of Metz. Two tons of bombs were dropped on the Metz railway station."

An official statement of the aerial operations March 26th says:

"On Monday our aeroplanes were employed almost entirely in bombing the enemy's troops and transports massed in the areas behind the battlefront and in attacking them with machine gunfire from low heights. Twenty-two tons of bombs were dropped in this work and over 100,000 rounds were fired from the machine guns.

"All our pilots reported that the ground targets offered by the enemy surpassed description. They were able to drop their bombs with accuracy and to fire with effect right into the center of infantry battalions in close formation and into columns of cavalry and transport.

"A certain amount of fighting in the air took place, but it was less intense than on the previous day. Thirteen hostile aeroplanes were brought down and ten were driven down out of control. The majority of our casualties were caused by the low-flying machines by fire from the ground.

"During the night our night-flying aeroplanes continued to bomb and attack with machine gun fire the enemy's troops in his forward areas and transport on the roads leading to the front."

Increasing work by the contact patrol of the British air service is reported in the announcement of March 27th as follows:

"Great concentrations of our aeroplanes were carried out today over points threatened by the enemy, and masses of our machines attacked with machine gun fire and bombs the enemy's infantry and cavalry.

"Thirty tons of bombs were dropped by us and hundreds of thousands of rounds of ammunition were fired into the enemy. While this fighting was maintained throughout the day, our infantry aeroplanes kept watch along the front and reported changes in the situation as they occurred.

"Twenty hostile machines were brought down in air fighting and two others were shot down by anti-aircraft guns. Twelve of ours are missing.

"During the night our night flying squadrons kept up a continuous attack on the enemy's troops in Bapaume, Cambrai and Peronne. Seventy-five thousand rounds were fired by them. Twenty-four tons of bombs were dropped on important centers of the battle front. In addition, four tons of bombs were dropped on the Valenciennes Railway station, through which the enemy's troop trains were passing on the way to the front."

British aviators took a heavy toll of lives as a result of their machine gun fire, according to the announcement of March 28th, which follows:

"Low flying was again carried out Wednesday by large bodies of our aeroplanes, while our infantry machines continued their work of reporting the positions on our battle line.

"More than thirty tons of bombs were dropped and a quarter of a million rounds of ammunition were fired from a height that insured accuracy on different targets.

"Severe casualties are known to have been inflicted on the enemy, and the bringing up of his troops and ammunition was delayed.

"Twenty-four German machines were brought down in the air fighting and seven were driven out of control. Two hostile observation balloons also were destroyed. Nineteen of our machines at present are missing.

"A proportion of these are believed to have landed on our side of the line. A very heavy fire directed against our machines from the ground accounted for the greater portion of our casualties.

"During the night the bombing of Bapaume, Bray and Peronne continued with the utmost vigor. Over a thousand bombs were dropped and thousands of rounds of ammunition were fired at good targets, which were plentiful and easy to see in the moonlight. Our pilots saw their bombs bursting in the middle of columns of troops, transports and encampments.

"Four of our aeroplanes are missing.

"On Wednesday the Sablons station at Metz was bombed, over ten tons of bombs being dropped. Explosions were seen on sidings and along the railway. Today our machines carried out a successful raid on the station at Luxemburg. Twenty-one heavy bombs were dropped and several were seen to burst on their objectives."

Sixteen German aeroplanes were put out of action on March 30th by the British, it is announced officially. The statement follows:

"A majority of our attacks were made on enemy groups on the battle front Thursday south of the Somme, where large concentrations of the enemy were constantly reported. The work continued until dark, in spite of rainstorms and low clouds. Twenty-six tons of bombs were dropped and nearly 250,000 rounds were fired upon different targets.

"There was not much fighting, considering the number of British machines in the air, but on the battle front the fire from the ground became very heavy. Nine German machines were brought down, five others were disabled and two others were shot down by fire from the ground. Twelve of our machines are missing."

Another British report on aviation issued March 30th says:

"A great deal of fighting took place (Friday), the ennemy's low flying machines being particularly active in this area. Nine hostile aeroplanes were shot down and two were driven down out of control. Two of ours are missing.

"During the night more than twelve tons of bombs were dropped on Bapaume and roads in the vicinity and also on roads and villages east of Arras. Direct hits were obtained on ammunition dumps and transport and railway lines. One of our machines is not yet located."

The British official announcement for March 31st reports aerial activity as follows:

"After noon Saturday the weather completely broke, but our airmen in spite of the driving rain continued to take part in the battle south of the Somme. There was heavy air fighting between our enemy and low flying machines. Twelve hostile aeroplanes were brought down and three were disabled. One hostile balloon was destroyed and two other German aeroplanes were shot down by our anti-aircraft guns. Five of our machines are missing."

Bruges was bombed by naval aeroplanes, says the announcement of March 25th, which follows:

"Three bombing raids were carried out on the Bruges dock, and many direct hits were obtained. Bombs were seen to burst close to destroyers. Several torpedo boats, a destroyer, and an armed trawler were attacked. One of our aeroplanes was forced to land in the sea. The pilot was picked up by a French destroyer. All the other machines returned safely."

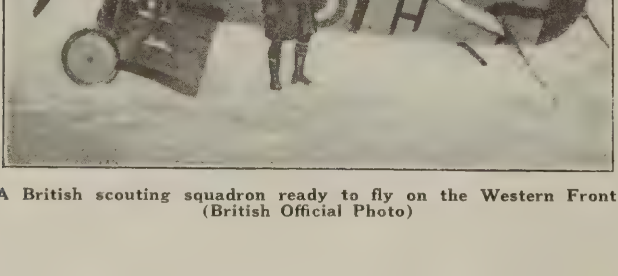
ITALY

There has been remarkable aerial activity over the lines on the Italian front, the War Office announced March 25th. Eight enemy machines were brought down. There has been a lively artillery battle at various places between Lake Garda and the Brenta.

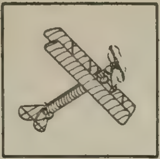
Italian aeroplanes bombed railway lines in the Lagarina valley and the aviation grounds on the Livenza.

The official announcement of March 26th reports the following aerial operations:

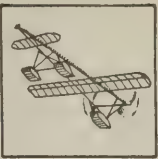
"Five enemy aeroplanes were brought down by our aviators at Val Dobbiateri, Moriago, San Pietro and Biadene. Another 'plane was brought down by the French aviators at Montebelluna."



A British scouting squadron ready to fly on the Western Front.
(British Official Photo)



MODEL NEWS



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PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.

MODEL AERO CLUB OF OXFORD
Oxford, Pa.

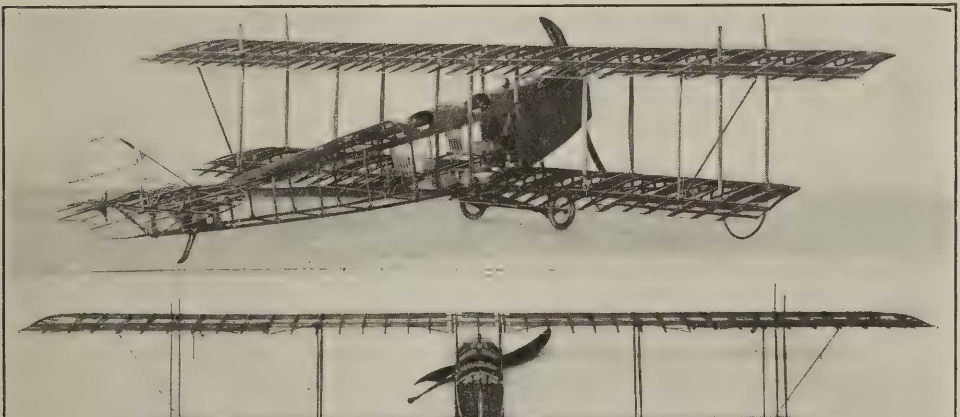
Scale Models of the Halberstadt and Wright Flying Boat

THESE two scale models were built by Mr. Jacob Dinnell, of Kent, Connecticut, and he sends us the following description of them:

The Halberstadt Chase plane has a wing spread of 30 inches and an overall length of 25 inches. It is an exact model of the famous Halberstadt D II which for a long time was the best type of German fighting machine. The fuselage is built up of 5/32 inch square basswood and is covered with rice paper and a heavy coat of varnish. The cowlings are of wooden frames covered with paper except for the engine hood which is of sheet aluminum. The motive power is furnished by 40 feet of 1/16 inch square rubber, driving direct onto a 9 inch propeller. The tail assemblage consists of a pair of elevators with a surface of 16 square inches and a vertical rudder with a surface 4 square inches, none of the Halberstadts having any vertical or horizontal stabilizing fins. The running gear is of 5/32 inch round reed mounting a pair of 2 inch rubber tired wheels. The 6 inch axle is held onto the struts by elastic bands which serve as shock absorbers. The main wing frames consist of two ⅛ x 3/16 inch beams with double ribs at intervals of 3 inches. These ribs are of 1/16 x ⅛ inch white holly and have a chord of 4½ inches. The ailerons are 4 inches long by 1½ inches wide and are counterbalanced in the same way as the rudder and elevators. The wings are covered on both sides with the same material as the body. The gap is 4 inches and the span of the lower wing is 3 inches less than that of the upper. There are six pairs of interplane struts, each of ⅛ inch round wood. The complete model weighs 10 ounces and for this reason it is not a distance flier but it rises from the ground and flies very well for a short distance.

The Wright Flying Boat has a spread of 3 feet and an overall length of 31 inches. The sides of its hull are of 1/16 inch board while the top and bottom are covered with two layers of varnished rice paper. The step is ½ inch high and from this forward the hull is V bottom. The power is furnished by 60 feet of 1/16 inch square rubber divided into four skeins. Two sprocket gears are mounted in the center of the hull and one skein runs from each end of both gears. The power is transmitted from there to the propeller shafts by fine brass chains. Each shaft mounts a 10-inch Wright type propeller. By using this method it not only allows you to have the propellers in the center of the machine but it does away with all bearing friction, as the pull is equal at both ends of the gears. The tail assemblage consists of a pair of horizontal fins with the elevators attached to their trailing edge. It has an area of 90 square inches and is raised 1 inch from the deck. The vertical fin and rudder stand 11 inches high and have an area of 20 square inches. The main wing frames are of ⅛ x ¼ inch wood with double ribs 3 inches apart. The aileron frames are of aluminum wire and the whole is covered with rice paper and varnished. The lower wing is four inches shorter than the upper and both chord and gap are 6 inches. There are four pairs of streamline struts and two pairs a little heavier, which hold the propeller shafts. The balancing pontoons are made in the same manner as the hull, the sides being of $\frac{1}{16}$ inch wood and the top and bottom of paper. They are 6 inches long and 2½ inches high at the stern and are held by aluminum wire struts. A full set of controls like those in use in the government training machines is installed in the cockpit just forward of the main planes. The tail and rudder are connected by threads and the ailerons by flexible wire working around ¼ inch pulleys.

Mr. Dinnell is now building an Albatross D-III and if it is successful will give us a description of it. The photographs of this model will appear in a later issue.



Three views of the unusually accurate scale model of a Canadian Curtiss J N 4 B aeroplane. The details are correct in all dimensions, being made from the actual blueprints of the Canadian Aeroplanes, Ltd., Toronto. Photos by courtesy of Mr. Ericson, in charge of the Canadian factory.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Fly-by-the-Light-o-the-Moon Co.

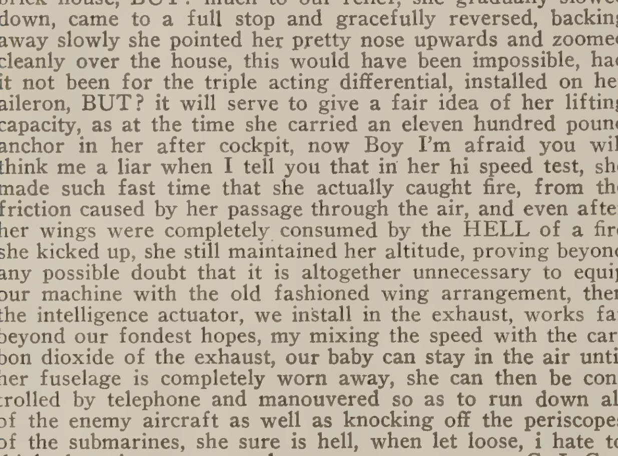
Gentlemen:—Our Fly like Hell, model 00 is a bear, it is really surprising, the stunts she capers through, say old scout, the first time i took her out i sure was astounded, as i opened her up, just a little, she humped her tail up under the landing gear, bucked twice and was off, of course she had been fitted with double acting longeron control which made her, to a certain degree automatic in her movements, nevertheless we were a trifle uneasy when we saw her heading straight for a brick house, BUT? much to our relief, she gradually slowed down, came to a full stop and gracefully reversed, backing away slowly she pointed her pretty nose upwards and zoomed cleanly over the house, this would have been impossible, had it not been for the triple acting differential, installed on her aileron, BUT? it will serve to give a fair idea of her lifting capacity, as at the time she carried an eleven hundred pound anchor in her after cockpit, now Boy I'm afraid you will think me a liar when I tell you that in her hi speed test, she made such fast time that she actually caught fire, from the friction caused by her passage through the air, and even after her wings were completely consumed by the HELL of a fire she kicked up, she still maintained her altitude, proving beyond any possible doubt that it is altogether unnecessary to equip our machine with the old fashioned wing arrangement, then the intelligence actuator, we install in the exhaust, works far beyond our fondest hopes, my mixing the speed with the carbon dioxide of the exhaust, our baby can stay in the air until her fuselage is completely worn away, she can then be controlled by telephone and manouvered so as to run down all of the enemy aircraft as well as knocking off the periscopes of the submarines, she sure is hell, when let loose, i hate to think about it, seems unreal.

G. J. C.

A Four Masted Cruiser

A description of our wonderful four masted atmospheric cruiser (The WILD PEGASSUS), seen from below it resembles four zeppelins tied together, its cargo capacity rivals that of seven ocean liners, it has the hertofore unattainable speed of 811¼ miles PER? & then some, her vertical longerons make her somewhat difficult to handle in a low breeze, otherwise she is as tractable as the ordinary tank in the air, it is a pretty sight to see her stall and zoom sideways, while her upside down performance is a marvel of grace, her delicate construction accounts for the installation of the 2700 h.p. steering gear on her hurricane deck. By the GERMANS she has been christened the YANKEE SNATCHER as she has been trained to hover over the battlefields and snatch HOWITZERS from the enemy, dropping them on the boarding-house of the KAISER, thereby causing much annoyance and loss of sleep to the bologna sausage tribe, her ocean work is also remarkable, she can without any apparent effort, by the use of her powerful magnet attached to her center-board, readilly lift the heaviest submarine from the ocean and unaided bring it to the base of operations, we are at present piling up all the submarines at the mouth of the kiel canal, causing its waters to back up and slowly but surely drowning out the enemy.

G. J. C.



THE INESTIMABLE SCOUT

Aviator (who has landed badly):—"Thank you, sonny, I'm all right; but you might see if that cow needs any attention, and then I want you to take my card to the Rector and say I'm awfully sorry about the spire. After that you will please send off this wire, and ask the local bicycle plumber to come here—and above all, don't forget to bring some cigarettes! I'll stay and beat off the souvenir hunters."—Courtesy Flying London.

The Diary of a French Building

1917	
Sept. 7 (3 p. m.)	Americans arrive.
Sept. 7 (3:10 p. m.)	Suggestions made to Buvette proprietor that he build an addition to his Buvette.
Sept. 29	Suggestion sinks in.
Oct. 14	Still sinking.
Oct. 23	The momentous decision.
Nov. 4 (8 p. m.)	Consults architect.
Nov. 4 (9:15 p. m.)	Plans completed.
Nov. 12	The first brick.
Nov. 14	The second brick.
Nov. 16	The third brick.
Nov. 17 to Dec. 1	Rest! Beaucoup de travail.
December (entire month)	Fate in the balance,—to be or not to be...
1918	
Jan. 4	The walls and roof meet.
Jan. 18	The iron gratings arrive.
Feb. 11	Work begun on the vaults.
Feb. 12	Work stopped to watch Sergt. Enowitz do a "Right by Fours."
April 15	Hurrah! Hurrah! The door knobs have arrived.
May 8	The door knobs don't fit.
June 11	The business of interior decorating.
June 11 (8 minutes later)	It's finished! The Building? No, the interior decoration!
June 15	It is suggested to the Frenchman that the building might have a floor.
June 18	"Yes, that's right, we ought to have a floor."
August 20	The grand opening! Loud cheers. Our first anniversary.
Later	Postponed indefinitely. They forgot the lighting.
1919	
Jan. 1	It's finished! It's finished!
Next day	Extra! Extra! Kaiser commits Suicide by eating Sgt. Lowry's Goldfish! Extra! Extra! German Army surrenders! Extra! Extra! We're going home next week! Extra! Extra! Extra! Ext...

A. B. T.

Extract from one of the Pages of "The '9' Times."
Published by the Enlisted Men, Base Hospital No. 9.

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COLLEGE POINT, N. Y.

(Continued from page 215)

Nicol, Carlisle F.	FLR
Notron, Paul T.	SLR
Norris, Byron B.	SLR
Nelson, Theodore E.	SLR
Nolker, Herman W.	SLR
Nicholson, Knox W.	SLR
Norton, Henry Kittredge	SLR
Nugent, Daniel Casey, Jr.	SLR

O

Orb, John A.	SLR
Osborne, Loyall Allen, Jr.	SLR; DIK
O'Brien, Maurice F.	SLR
O'Brien, Raymond H.	SLR
O'Flaherty, Daniel V.	SLR
O'Melveny, Stuart	SLR
Olsen, Eugene F.	SLR
Orbison, William F.	SLR
O'Neil, James H.	SLR
Olds, Edward C.	SLR
Osborne, Henry P.	SLR
Ott, Lambert, Jr.	SLR
Oliver, Prince A.	LHV
O'Brien, Robert E.	
Olson, Charles Willard, Jr.	SLR
Onotavia, Thomas L.	FLR
Osborne, Charles L.	FLR
Olson, Horace E.	SLR
Ordway, William F.	SLR
Olsen, Clarence A.	DIK
O'Reilly, Paul L.	SLR
Orb, John Alexander, Jr.	SLR; KST
O'Meara, Cornelius S.	SLR

P

Philbrook, Jacob B.	PFO
Perry, William Howard	SLR; PMT
Page, Eugene F.	SLR
Painter, Parker	SLR
Powell, Charles S.	SLR
Pillsbury, Edwin S.	RSD
Powell, Edward Merriam	SLR; GLC
Peterson, Clifford Vance	SLR; DIK
Perkins, Grafton B.	KST
Pierce, Leslie E.	FRF
Prince, Harry W.	SLR; FRF; TFT
Potter, Charles Mercer	SLR; DIK
Palmer, Ralph W.	SLR
Parker, Ashton	SLR
Pratt, George W.	SLR
Pendleton, James D.	SLR
Polk, George W., Jr.	SLR
Price, Stuart E.	SLR
Peters, Sidney V. W.	SLR
Petree, Leo W.	SLR
Pike, Vernon B.	SLR
Pynn, Leander G.	SLR
Powell, Charles Smith	SLR; FOB
Page, Eugene Ferdinand	SLR; GLC
Painter, Parker	SLR; RWT
Pearson, James A., Jr.	SLR
Pardy, George W.	SLR
Parkhurst, Amos J., Jr.	SLR
Peabody, Howard B.	SLR
Philbrook, Jacob B.	SLR
Philbrook, Philip E.	SLR
Pratt, Clifford V.	SLR
Penberthy, Paul	SLR
Perry, William L.	SLR
Pogue, Davenport	FRF
Post, Speed L.	DIK
Powell, Edward Merriam	FRF
Phelps, Richardson	SLR
Page, Eugene F.	FRF
Prem, Frank H.	SLR
Parker, Albert Nelson	SLR
Parker, McDonald Robert	SLR
Parkin, Walter F.	FRF
Philbrick, Fred	FLR
Page, Edwin R.	LDT

R

Richardson, Elbert L.	SLR
Ristig, William B.	SLR; PFO
Robertson, Arthur	SLR
Rowley, Eugene C., Jr.	SLR
Royer, David A.	SLR
Ray, Paul M.	SLR; PFO
Reber, James S., Jr.	SLR
Ryle, Thomas J.	SLR
Remy, Victor A.	CPR
Rieder, Louis D.	FRF
Royce, Walker W.	PFO
Robison, Ralph Turner	SLR; KST
Ritchie, William John	SLR; GLC
Reis, John Brooks	SLR; EOT
Ramseur, Benjamin Frederick	SLR; KST (2)
Richardson, Ross T.	SLR
Rivers, Walter B.	SLR
Randall, John F.	FLR
Ray, Wilmer	SLR
Reddy, Philip J.	SLR
Reynolds, Watkins W.	SLR
Rolston, Brown	SLR
Royall, John E., Jr.	SLR
Russ, Leon F.	SLR
Rudd, Guy K.	SLR
Royle, William H.	FLR
Roberts, Carroll H.	SLR
Reavis, Charles F., Jr.	RSD
Remy, Victor Allison	CPR; CSO
Rowley, Eugene Cooper, Jr.	SLR; KST
Robertson, Arthur	SLR; KST
Ryle, Thomas Joseph	SLR; GLC
Ristig, William Bradford	SLR; RWT
Ray, Paul Millison	SLR; KST
Roberts, Harris C.	FRF
Rader, James W.	SLR
Rafeld, Max L.	SLR
Ridgeway, Edwin T.	SLR
Richardson, Elbert Lindsey	SLR; KST
Reber, James Shoemaker, Jr.	SLR; FOB
Royer, David Ames	SLR; PMT
Reed, Harvey S.	SLR
Roberts, Roscoe O.	SLR
Rogers, Franklin L.	SLR
Roth, Archie F.	SLR
Russell, Lawrence L.	SLR
Rothfeld, Laurence	SLR
Royce, Walker W.	SLR
Rorick, Estell Horton	FRF
Riedel, George D.	FRF
Roadhouse, Wilbur	SLR
Regan, Daniel Charles	SLR
Robinson, Charles McKinley	SLR
Russell, Aubrey G.	FLT
Rogers, Thomas C.	SLR

S

Simon, Herbert Jerome	FLR
Stemgridge, Alfred Reginald	SLR; KST (2)
Sanborn, James E.	SLR
Saunders, Minott F.	SLR
Schnack, Rolin N.	SLR
Sharkey, Graham P.	SLR
Silcott, Arthur E.	SLR
Simmons, Robert G.	SLR
Smith, Clarence E., Jr.	SLR
Smith, Eben B.	SLR
Smith, Glenn E.	SLR
Spencer, Frederick G.	SLR
Steele, Albert S. J., Jr.	SLR
Stiller, George M.	SLR
Stock, Hugo L.	SLR
Sawyer, Gordon Blake	SLR; SMM
Sloan, Samuel A.	PFO
Scarborough, William Bellows	SLR; SMM
Sullivan, Henry B.	PFO
Smith, Paul J.	FRF
Swan, Charles H.	SLR; TFT
Schlotzhauer, Harry A., Jr.	FLR
Stewart, Robert S.	FLR
Strong, George Eugene	SLR; DIK
Stanley, Walter Scott	SLR; EOT
Stephenson, Arthur R.	SLR; LDT
Stauffacher, Earl Monroe	SLR; EOT
Sawyer, Herbert S.	SLR
Sheer, Coman K.	SLR
Slaven, Lant R.	SLR
Slocum, Winfield S.	SLR
Smith, Edson B.	SLR
Sneckner, Leonard A.	SLR
Snodgrass, David L.	SLR

(Continued on page 224)

(*Continued from page* 217)

tions, always favorable to manufacturing, electric power, rates not in excess of those at any other point, gives to the producer of any manufactured article from the raw materials named an advantage that is so apparent to the investigator that little remains except to secure a suitable location for his plant, after he has made a close investigation. It is these conditions that has enabled Chattanooga to double her population in less than 20 years, and to more than double the capital invested in manufacturing enterprises in 10 years. With a selling value on the manufactured product of approximately one hundred million dollars per annum.

The AERIAL AGE is catering to a clientele that did not exist 10 years ago, and yet in one decade, has developed from a fad to a national necessity. No manufactured article has had such a record of growth and it takes no vision to see that even with war needs on, the surface is not being comfortably skimmed. In a very few years, we will all smile over Post Master Burleson's conservative order for carrying mail between Washington and New York, by aeroplane service, but it is by such steps that ordinary business grows.

No better location for the production of aeroplanes could be found than Chattanooga. We have in the city 11 well-established wood-working plants, employing over 1,800 skilled wood workmen, with modern dryhouse capacity of over 250,000′ per day, with a finishing capacity of 230,000′ per day, and with shop floor space of 620,000 sq. ft. Pacific Coast spruce can be shipped to Chattanooga, thoroughly dried, put into proper shape, and be reshipped at a saving over the carrying cost of unworked spruce from the Pacific Coast to Eastern aeroplane producing points. Mahogany reaching any one of the five southern ports can be handled practically in the same way, naturally we have speculated as to just why these conditions should not be taken advantage of. The work of assembling these planes in Chattanooga would be less than at any of the present producing points, the one item of crating them will be 50% to 75% less. Dayton, Ohio; Pensacola, Fla.; Memphis, Tenn., are but 18 freight hours out of Chattanooga,—Norfolk, Va., not over 30,—San Antonio, Texas, not over 4 days. We have in addition to the wood-working establishments 25 to 30 foundaries running on grey iron, one steel castings foundry, one malleable iron, and one brass foundry. We also have a large stamping and enameling plant, so that many of the items that would make up an aeroplane could be very little, if any additional cost, made right here in Chattanooga.

Some day when we are manufacturing parcel post machines the astute manufacturer will discover that Chattanooga is the proper location for his business.

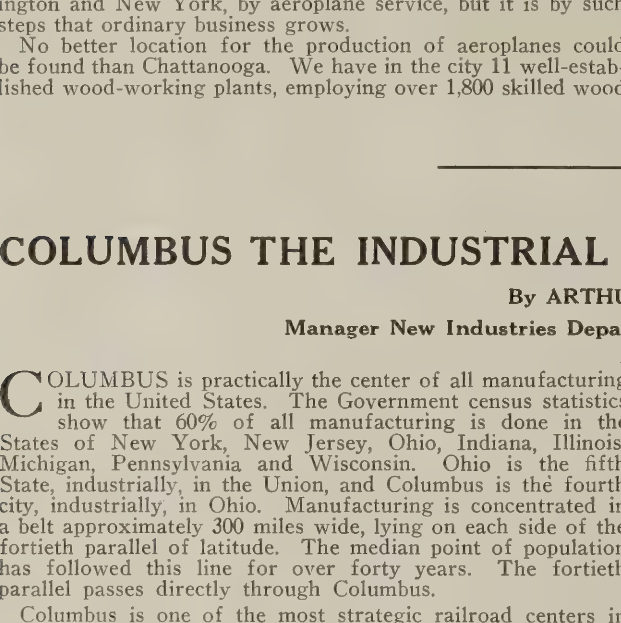
COLUMBUS THE INDUSTRIAL CENTER OF THE UNITED STATES

By ARTHUR B. LEONARD

Manager New Industries Department, Columbus Chamber of Commerce

COLUMBUS is practically the center of all manufacturing in the United States. The Government census statistics show that 60% of all manufacturing is done in the States of New York, New Jersey, Ohio, Indiana, Illinois, Michigan, Pennsylvania and Wisconsin. Ohio is the fifth State, industrially, in the Union, and Columbus is the fourth city, industrially, in Ohio. Manufacturing is concentrated in a belt approximately 300 miles wide, lying on each side of the fortieth parallel of latitude. The median point of population has followed this line for over forty years. The fortieth parallel passes directly through Columbus.

Columbus is one of the most strategic railroad centers in the United States, because of its geographic location and commercial importance. The Government of the United States has already recognized this fact by locating here its largest army recruiting depot and training school. One of the largest aviation ground schools in the country has been established here in connection with the Ohio State University. The Pennsylvania Railroad Co. has located here one of its largest repair shops, and has just let contracts that will materially increase the capacity of these shops. The State of Ohio has located practically all of its institutions here, including the State Capitol and the University; and Henry Ford, the great automobile manufacturer, has established in Columbus one of his largest assembling plants. In other words, the greatest Government, the greatest railroad company, the greatest State, and the greatest manufacturer have already recognized the geographical and railroad advantage of Columbus. Columbus has sixteen railroad divisions, as follows:



MAP SHOWING TERRITORY WITHIN A FIVE HUNDRED MILE RADIUS

Pennsylvania Lines West—Pittsburgh Division, Indianapolis Division, Little Miami Division, Toledo Divsion, Akron Division.

Baltimore & Ohio—Newark Division, B. & O. Southwestern Division.

Hocking Valley—Toledo Division, Hocking Division.

Big Four—Cleveland Division, Cincinnati Division.

Toledo & Ohio Central—Western Division, Corning Division, Eastern Division, St. Marys Division.

Norfolk & Western.

There are eleven electric railways operating out of Columbus in all directions.

For power purposes Columbus can offer electricity, steam or gas. Electric current in Columbus is produced and sold as low as three-fourths of a cent per kilowatt hour. Even the famous water power plants of Niagara Falls do not sell it any cheaper. Natural gas for industrial purposes may be had in Columbus as low as 15c per cubic feet, the rate depending upon the mixmimum consumption. The gas supply for Columbus is assured for many years to come and is a great industrial asset. The proximity of Columbus to the coal fields of Ohio and West Virginia make Columbus one of the leading coal centers in the United States. Columbus gets the advantage of low prices on coal because of its advantageous location, midway between the fields of Ohio and those of West Virginia. Coal to the lakes passes through Columbus by the millions of tons. Even during the serious coal shortage of the past winter, Columbus suffered much less than other industrial centers because of this fact.

The labor supply in Columbus is ample. Intelligent and skilled workmen and an exceptionally good class of common labor is available. Columbus has never suffered a severe industrial strike and its amnufacturing establishments individually or as a whole are free from disturbances of this kind. In fact, one of the strongest arguments for Columbus, industrially, is its freedom from labor troubles; and best of all, Columbus labor is American labor.

Realty conditions in Columbus are such that Columbus manufacturers possess many advantages. Many of the industrial plants are located just outside the city limits where they

Maximum Production Made Possible Through Intensive Co-operation in A British Aero-Engine Factory

Were All Your Grinders, Drills, Lathes, etc., Working for Uncle Sam's Aircraft Program Last Month?

If they were not working every available hour it is your duty to make your capacity known to the aeronautic concerns that are under contract to the Government—that are helping Win the War in the Air for the Allies.

Ask our CONTRACT WORK DEPARTMENT how you can help.

AERIAL AGE WEEKLY
280 Madison Ave.
New York City

Advertising Builds Up Good Will and Saves Taxes

enjoy the privileges and benefits of city utilities, while paying the much lower tax rate of the township. The tax rate in Columbus at present is $1.40 per $100.00 of assessed valuation, and industrial property is commonly assessed at about 60% of its actual value. Columbus is in the forefront of American cities in its public utilities, possessing one of the finest and largest water purification plants, a municipal lighting plant, sewage disposal plant, garbage disposal plant, all municipally owned and operated. At the same time the per capita debt of Columbus is much lower than that of the average American city of its size.

Living conditions in Columbus are exceptionally good. The 40th parallel of latitude passes directly through Columbus and is marked by a boulder in the campus of the Ohio State University. It has been recognized by the best authorities for many years that the best climate is to be found in close proximity to the 40th parallel. Columbus is a city of home owners. An unusually large percentage of wage earners own their homes. The residents of Columbus are largely American born and are intelligent and congenial. Beautiful streets, picturesque streams, large parks and playgrounds, fine state institutions and grounds, including the State Capitol, splendidly appointed clubs, are added attractions. Sixty large public school buildings and a number of private and parochial schools offer excellent facilities for education. The Ohio State University with its courses in business administration, all branches of engineering, medicine, agriculture, arts, and aeronautics, is one of the greatest institutions of its kind in the world.

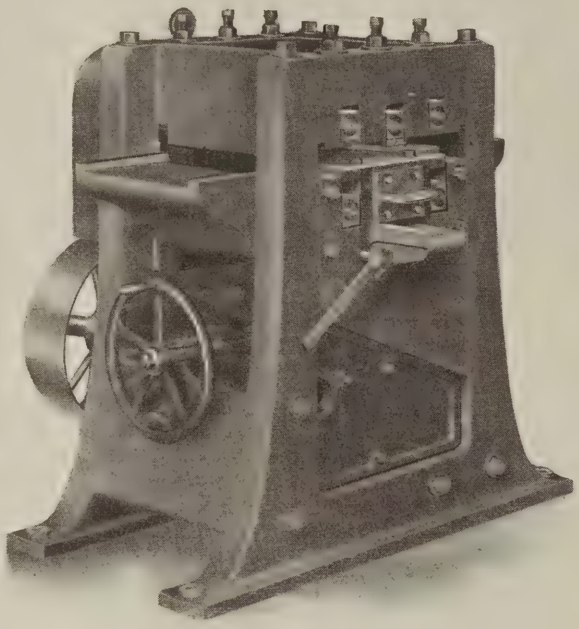
All the large manufacturing establishments in Columbus are cooperating with the United States Government in producing war material. There are several large companies now in Columbus that are making parts or accessories of aeroplanes. Among the products now being manufactured here for this purpose are gears, drop forgings, wheels, air pumps, oil pumps, water pumps, air relief valves, pump plugs, cam shaft housings, rocker arm coverings, bearing supports, various screw machine products and metal stamped goods. These products are now being shipped to Berkeley, Cal.; Buffalo, N. Y., and Dayton, Ohio. Columbus is one of the largest centers of die tool making in the United States, and large quantities of die tools for aeroplane factories are now being turned out in Columbus. One of the most up-to-date foundries for aluminum castings has just been established here to meet the demands of the aeroplane industry. Columbus for years was famous as the buggy center of the United States. These former buggy plants are available for making the bodies, propellers and other wood parts for aeroplanes. In other words, Columbus is a first-class location for an assembling plant. We have all the important requisites at hand.

The attitude of the community may have an important bearing on the proper location for such an industry. Columbus has already gained fame for the exceptional manner in which her citizens have responded to all the calls for service in the present war. Both of the Liberty Loans were very largely oversubscribed in Columbus; the Red Cross fund, the Army Y. M. C. A., and other war relief funds have likewise been responded to most generously here, much larger sums being given than were asked for. The most recent proof of willingness to do her part in the war, was shown by the remarkable success of the Community War Chest campaign. The plan of having a community fund to meet the constantly recurring needs of war relief work is one which Toronto, Canada, has used successfully. Columbus undertook to raise a fund of $3,000,000 for such a War Chest, and in a four days' campaign her 250,000 citizens pledged a quarter of a million more than had been asked for. This is about $13.00 for every man, woman and child in our community.

To sum up the advantages of Columbus: We have unexcelled railroad facilities with direct traffic line service to the chief Atlantic ports. Industrial conditions are exceptionally good in Columbus, whether considered from the standpoint of labor supply, accessibility of raw materials, realty conditions, or cost of power. Much of the preliminary work in aeroplane manufacture has already been gone through by Columbus manufacturers and workmen have been trained to the accuracy and skill which is necessary in this type of work. There is no industrial city in the United States in which living conditions are superior to those in Columbus. The housing code regulating the construction of residences and tenements is a model all over the country. Street car service with eight tickets for twenty-five cents makes it possible for the workman to live amid pleasant surroundings. Columbus is therefore an ideal city in which to do business; it is an ideal city in which to live; and, best of all, Columbus has a Chamber of Commerce composed of about 1,800 of the most active citizens of the community, anxious to promote its growth and prosperity.

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a



Whitney Scraping and Toothing Machine

WHITNEY

Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog and samples of toothing

Baxter D. Whitney & Son

WINCHENDON MASSACHUSETTS

(*Continued from page 221*)

Spitzer, Ray C.	SLR
Stocking, Milan H.	SLR
Sutcliffe, Robert	SLR
Scott, Walter	SLR
Shirey, Walter H.	SLR
Skidmore, Andrew A.	SLR
Slater, Harry E.	SLR
Smith, Harry G.	SLR
Smith, John R.	SLR
Snyder, John A.	SLR
Speed, William G.	SLR
Stevens, Wade	SLR
Stewart, Walter J.	SLR
Sweeley, Lester J.	SLR
Silver, Eugene W.	SLR
Smith, Kent H.	SLR
Silver, Eugene W.	SLR
Smith, Kent H.	SLR
Sturrock, Walter	SLR
Sewell, Robert Brewster	SLR; TFT
Stevenson, Frederick Fitch	SLR; KST (1)
Shaffer, William L.	SLR
Shapiro, Robert	SLR; TFT
Smith, Harry G.	DIK
Schmitt, Ralph S.	FRF
Stock, Hugo Louis	SLR; DIK
Simmons, Arthur Henry	SLR
Savage, Arthur Henry	SLR
Schroeder, Carl Frederick Amandus	SLR
Smith, Frank Arthur Cushing	SLR
Stokes, James Henry Ward	SLR
Samson, Emory A.	FLT
Scholes, George	FLT
Schulze, Laclair D.	FLT
Shaw, Erwin D.	FLT
Shoemaker, Fred T.	FLT
Silling, Charles A.	FLT
Stanley, Julien C.	FLT
Stivers, Gerald D.	FLT
Sloan, Samuel A.	SLR
Sweney, Hart T.	SLR
Sharkey, Graham Patrick	SLR; KST
Sanborn, James Elmer	SLR; KST
Sweet, Claude Leonard	SLR; WFO
Smith, Clarence Bruce, Jr.	SLR; KST
Smith, William A.	JRC
Steele, Albert Sydney Johnson, Jr.	SLR; KST
Spencer, Frederick Gilman	SLR; EOT
Stover, Roland M.	Note 6
Schanck, Rollin Neale	SLR; DIK
Smith, Eben Bruce	SLR; RWT
Saunders, Minott Francis	SLR; EOT
Silcott, Arthur Edward	SLR; DIK
Stoddard, David L.	SLR
Snyder, W. Hill	DIK
Stiller, George Milwayne	SLR; KST
Smith, Glen Evans	SLR; KST
Smith, Walter J.	FLR
Smith, Paulding	SLR
Spake, Ralph E.	SLR
Smith, Allyn G.	SLR
Smith, Paul R.	SLR
Smith, Wescott T.	SLR
Scantlin, Thomas E., Jr.	SLR
Schreiber, Ernest F.	SLR
Sherman, Alza C.	SLR
Stoddard, Marvin H.	SLR
Sullivan, Henry B.	SLR
Sultan, Thomas P.	SLR
Schulein, Benjamin M.	SLR
Scott, Alfred C.	SLR
Shackleton, Allan D.	SLR
Shields, Fred M.	SLR
Shoemaker, Louis J.	SLR
Slaughter, James M.	SLR
Stoddard, Herbert A.	SLR
Smiley, David B.	SLR
Spalding, Vaughan C.	SLR
Stedman, Nathan A., Jr.	SLR
Stewart, Haven C. R.	SLR
St. John, Alvin M.	SLR
Sanders, James O'Hear	SLR
Schaupp, John Martins, Jr.	SLR
Sears, Louis Albert	SLR
Snyder, Floyd	SLR
Steele, Cyril Hilding	SLR
Stees, Donald Bowers	SLR
Sutton, Harold P.	SLR

T

Twining, Ansley	MJR
Tucker, Raymond M.	SLR
Talbot, William C.	REV
Tilden, George Alfred	SLR; KST (2)
Tibbals, Earl B.	SLR
Taylor, William S.	SLR
Towle, Gerald	SLR
Townley, Francis Reid	SLR; KST
Thompson, George Sydney	SLR; DIK
Taylor, Edward C.	SLR
Taylor, Henry B.	SLR
Thompson, Seth W.	SLR
Trull, Charles E.	SLR
Tuck, Fred H.	SLR
Trotter, Daniel Kitrell	SLR; PMT
Tyrrel, Charles P.	FRF
Tilley, Milton	SLR
Tait, Edgar W.	SLR
Trowbridge, Jones R.	SLR
Tyndall, Frank B.	FLR
Thorne, Henry S.	SLR
Teasdale, Lawrence Wilson	SLR
Townsend, Henry Clark	SLR
Trail, Thomas Steele	SLR
Trammell, Charles Monroe	SLR
Taylor, James G.	FRF
Twining, Kingsley	MJR; CSO
Towle, Gerald	SLR; FOB
Trickey, Charles T.	PRC
Townsend, Edward Simpson	SLR
Thomas, Herbert F.	REV
Tanner, Herbert Johnson	SLR; KST
Tucker, Raymond Murdock	SLR; SBI
Tomkins, Calvin	FRF
Throneburg, Otto	CSO
Thompson, Joseph H.	RSD
Tibbals, Earl Barton	SLR; KST
Tolman, Crittenden A. C.	RSD
Thomas, Gerald P.	FRF
Thiel, Wiliam A.	SLR
Tinnerholm, Robert F.	SLR
Thurston, Troy G.	SLR
Tolbert, Benjamin H.	SLR
Tonkin, Thomas C.	SLR
Talbot, William C.	SLR
Taylor, Willis R.	SLR
Thompson, Roland S.	SLR
Tierney, John W.	SLR
Thomas, Walter G.	FLR
Taylor, William Sloan	SLR; FOB
Tighe, George R.	SLR
Thorne, Gordon C.	SLR
Trotter, Joseph T.	SLR

V

Van Deusen, Archibald B.	SLR
Van Horson, John M.	OSU
Vogel, Carl Conrad	SLR; TFT
Venable, Edward Carrington	SLR
Verhoff, Edward Augustus	SLR
Vogelback, William Edward	SLR
Vickery, Merritt Arthur	SLR
Vander Voort, John MacE.	SLR
Vosburg, Murray S.	SLR
Vosburg, Roydon	SLR
Veach, Thomas F.	SLR

W

Washburn, William C.	FRF
Wood, Rushmore	SLR
Walker, Charles Cunliffe, Jr.	CDT
Webster, John O.	SLR
Weisiger, Earl H.	SLR
Welsh, Miles E.	SLR
Williams, Herschel O.	SLR
Wohler, Chester B.	SLR

(*Continued on page 227*)

Thomas

THOMAS-MORSE AIRCRAFT CORPORATION

ITHACA, N.Y. U. S. A.

Contractors to U. S. Government

Winfree, Edward S.	SLR
Warner, Donald Amos	SLR
Warren, Kenneth Carlton	SLR
Weyant, Romer G.	SLR
Wherritt, Russell	SLR
Whitaker, Frederick Slack	SLR
Willrich, Edgar Gebhard	SLR

Y

Young, Samuel H.	SLR
Young, Wallace S.	SLR
Young, Daniel J.	SLR
Young, Fred M.	SLR
Yarborough, Robert S.	SLR

Z

Ziebur, Max C.	SLR; DIK
Zacher, Edwin F.	SLR

Aeroplanes Drop News to Belgians

Senator Henri La Fontain of Belgium, president of the executive committee in the United States of "Gifts for Belgian Soldiers," says that President Wilson's messages have greatly comforted the Belgians.

"There was great rejoicing last week in the occupied portion of Belgium. Allied aviators dropped in large quantities the complete text of President Wilson's speech, which was printed in small letters on cardboard sheets. At Liege many thousands were found, and our unfortunate compatriots, whose morale is always excellent, were greatly comforted.

"Many disputes arose between Belgians and Boche officers, who certainly did not always have the last word. There were many who remarked openly that the words of M. Clemenceau, Lloyd George and President Wilson had given them strength to wait two years or more if need be for the defeat of the Germans.

"Every one is anxious to have allied aviators keep them informed about present events, and nothing else could contribute more to help these Belgians living under German rule to endure District, in order to serve in the Aviation Section. He has made several speeches in Italy since his arrival there on duty.

Louis Seguin Dies in France

Louis Seguin, chairman of the board of the Gnome and Le Rhone Engine Co. and a pioneer in the development of aeroplane motors, died in Paris on March 7th. His grandfather was Marc Seguin, the French engineer who invented the water tube boiler. Louis Seguin organized the Gnome Engine Co. in 1895, which developed the Gnome and later the Le Rhone rotary aircraft engine. Both of these are being built in the United States for use on war aeroplanes.

Personal Paragraph

James E. Kepperly has been appointed general manager of the Curtiss Aeroplane & Motor Corporation of Buffalo, succeeding William A. Morgan. Mr. Kepperly has been associated with the Willys interests and is vice-president and counsel of the Willys-Overland, Inc. Mr. Kepperly has also been elected vice-president of the Curtiss Company, a member of the executive committee and a voting trustee.

New Aeroplane Flown to Washington

Robert Bounds of the Standard Aircraft Corporation of Dayton, Ohio, arrived in Washington, Friday afternoon, at three o'clock, having started from Dayton in the morning at 7 o'clock, negotiating the distance of 700 miles in a little more than eight hours. This establishes a new time record for a continuous non-stop flight across mountainous country.

The machine in which the flight was made is a new National biplane, armored, and driven by a Husitano engine, and can develop a maximum speed of 100 miles an hour. It has been tested thoroughly at Dayton, but has not been tried out by the government. It is announced that a series of tests is to be made here in an effort to have the plane adopted by the government as a battle plane.

Aviators Solve Technical Problems by Daily Study in Battle Conditions

It is clear from the reminiscences of Captain Guynemer, which are now being published, that the construction of an aeroplane is a matter of daily, even hourly, preoccupation. The aviator, that is if he is in the class of Captain Guynemer and Captain Duchenne, is a technician, working industriously with the manufacturer in the shop. Perhaps the yachtsman who watches the building of his yacht, and even has something to do with its design, is the closest parallel. The most successful aviator has at his command all the devices of the shops, all those magnificent tricks of the trade which make his achievements one of the marvels of the age. The public might miss this vital point. The test of the aviator is his technique. If he knows how to make a machine, and this is knowledge that can be taught, he can always capture the air.

The training and education of aviators is therefore an all important element of success. This training is an affair of science. The opinion of an English writer illustrates the point. He says: "The mastery of the world depends, it is clear, largely on a knowledge of science. Never was there a greater object lesson in regard to this than the present war. Perhaps the most conspicuous example is to be seen in the air. The war has forced men with feverish haste to learn its laws and to develop machinery for dealing with them. It is applied and technical science that is needed." Further experience has only confirmed what has been said as to the importance of gradual evolution in aeroplane construction.

Barlow Bomb Being Tested

Concentration of attention on the mysterious bombardment of Paris has revived interest in the Barlow aerial torpedo. It is said the soundness of the principle is conceded by experts of the army and navy.

Representative Hillson, of Connecticut, has taken a lively interest in the idea, and maintains that it should be elaborately experimented with at once. He is of the impression that the signal service is working on it, but as nearly as can be ascertained the service has as yet made no definite deal with L. P. Barlow, the inventor. It is said the signal service has "stalled" him for six months on these bombs. Now Congress is to be asked for an independent appropriation for an investigation of the merits of the aerial torpedo.

Message by Pigeon Saves Naval Aviator

Emery Stone, a naval aviator, who had been missing since March 5, has been picked up at sea by a patrol boat and was safe in an English hospital.

Engine trouble had forced him to alight on the ocean in his hydroaeroplane March 5, the aviator sending word of his plight to the American naval base by a carrier pigeon. A second message said Stone was picked up after floating four days. He is suffering from exposure.

Silence Speed

"NORMA"

Precision Service

BALL BEARINGS
(Patented)

The running of a 'plane or engine—its steadiness, its power, its smoothness, its dependability—rest ultimately upon the performance of a hundred component parts. Failure in one of these may destroy that smooth unity which differentiates good performance from unending bother.

Enquire into the dependability of magnetos and lighting generators. Those of demonstrated serviceability, of proved reliability, are standardized on "NORMA" Ball Bearings—have their own inherent superiorities fortified by "NORMA" Bearing speedability.

Be SURE. See that your Electrical Accessories are "NORMA" Equipped.

THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK
BALL, ROLLER, THRUST, COMBINATION BEARINGS

ERIE IS READY!

At this time, the most critical in our country's history, all hands must stand by to aid the Government.

The Erie Specialty Company is prepared to offer the greatest possible co-operation to the American manufacturer of aircraft, so that our government in this emergency may have the finest possible productions of the aeronautic industry.

Send us your requirements.

AIRCRAFT METAL PARTS

"All Erie Standard"

ERIE SPECIALTY COMPANY
Offices: 25 Pine St., New York
Factory: Erie, Pennsylvania

The Lanzius Variable Speed Aeroplane

Executive Offices 156 Broadway, Room 40,
New York City. Telephone 6668 Cortlandt.

Lanzius Aircraft Company

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of AERIAL AGE WEEKLY, published weekly at New York, N. Y., for April 1, 1918.

County of New York, }
State of New York, } *ss.*

Before me, a Notary Public in and for the State and county aforesaid, personally appeared G. Douglas Wardrop, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the AERIAL AGE WEEKLY and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Aerial Age Co., Inc., 280 Madison avenue, City.
Editor, G. Douglas Wardrop, 280 Madison avenue, City.
Managing editor, G. Douglas Wardrop, 280 Madison avenue, City.
Business manager, G. Douglas Wardrop, 280 Madison avenue, City.
Assistant business manager, Geo. A. Cavanagh, 280 Madison avenue, City.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Aerial Age Co., Inc., 280 Madison avenue, New York City.
Henry Woodhouse, 297 Madison avenue, New York City.
G. Douglas Wardrop, 280 Madison avenue, New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not apppear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only.)

G. DOUGLAS WARDROP.
Editor, Business Manager.

Sworn to and subscribed before me this 23rd day of March, 1918.

DANIEL F. NUGENT.
(My commission expires March 30, 1919.)
[SEAL] Certificate filed in New York County, No. 67.

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WEEKLY

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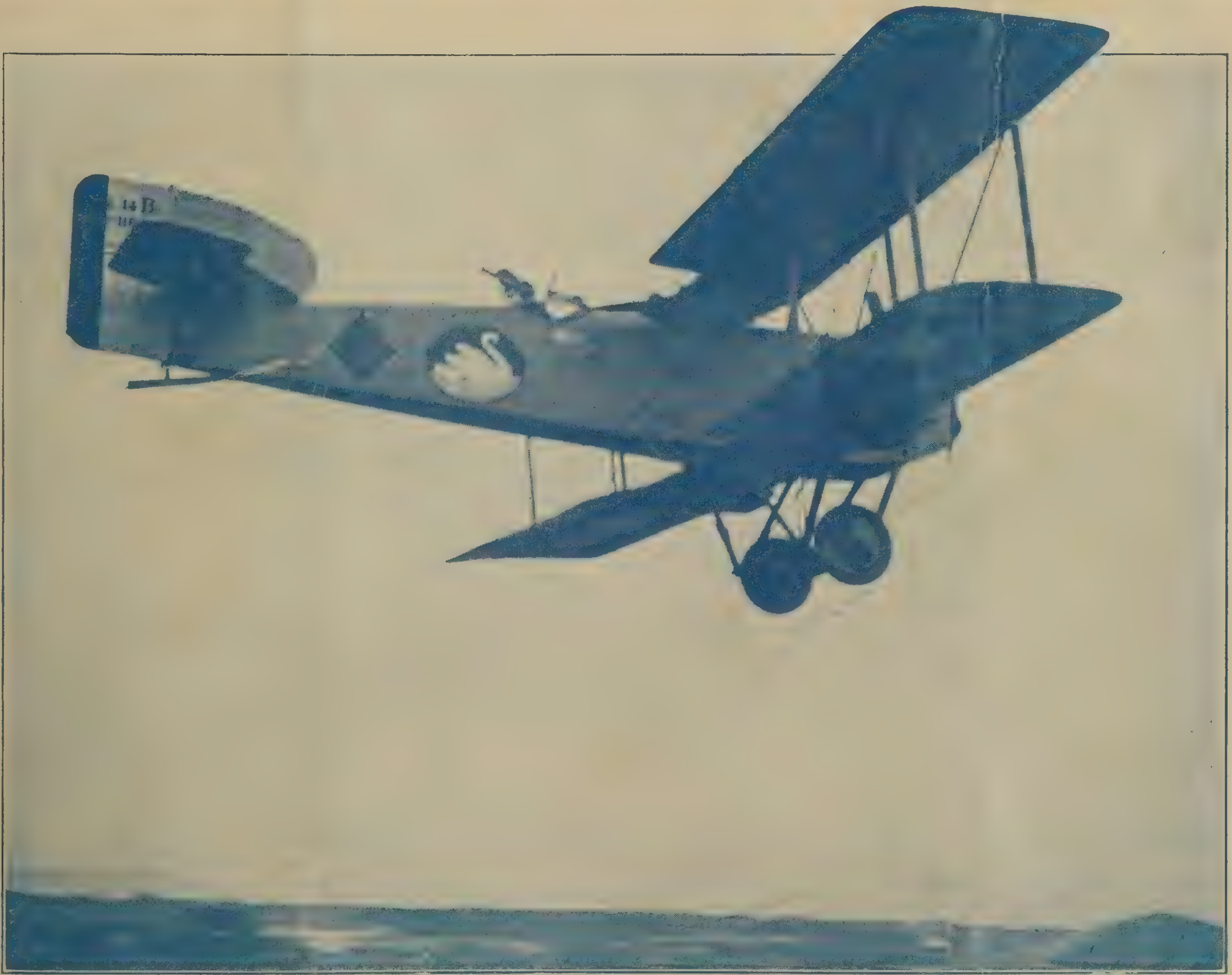

A French Breguet bombing machine in flight. On the rear can be seen twin Lewis guns mounted for use of the aerial photographer or observer.

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Let Us Stop Dealing With Minimums

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LET US STOP DEALING WITH MINIMUMS

By ALAN R. HAWLEY, President, Aero Club of America

OUR aeronautic accomplishments in the first year of war consist mainly of things that we have learned (let us hope) through experience and mistakes.

Let us hope that we have learned the size of the task of defeating Germany and the fallacy of relying on minimum.

As we look back to this one year of experience we see that the air program was not equal to the task of whipping Germany through the air.

The greatest of our national sins in the past year has been over-reliance on minimums—minimum plans, based on minimum understanding of the military situation, further weakened by minimum appropriations. We have also had some minimum men, having minimum knowledge and experience, who did not anticipate, as one must do in war times, the possible necessity of quick expansion, as well as possible delays, due to transportation of materials, labor conditions, mistakes, etc.

The one national resolution that we ought to make on the first anniversary of our entrance in the war should be to eliminate minimums of all kinds and adopt maximums in programs, men, appropriations, manufacturing facilities, etc. Having adopted maximums, let us add to each so as to have a substantial margin of safety to insure success under any circumtances.

The Air Program of July, 1917, was the rock-bottom plan made when Italy was victorious and Russia was still fighting.

It was based on the assumption that the Allies had Germany practically beaten and only needed some assistance to complete the task.

This program did not take into consideration that it takes an average of two aeroplanes to give an aviator the one hundred hours of preliminary and advanced training needed to make him fit for the present-day highly specialized work of a military aviator. Nor did it take into consideration that it takes close to one hundred per cent. replacements per month in aeroplanes and motor to keep aviators equipped for fighting. Nor did it take into consideration that it takes forty per cent. replacements in aviators per month to keep up the fighting personnel of aero squadrons.

In making this program the fact was overlooked that if the plan was to keep five thousand American aviators at the front, it was necessary to train twenty-five thousand. Therefore there would be required fifty thousand preliminary and advanced training aeroplanes with which to train them speedily. The number of aeroplanes under construction today is not sufficient to even give the preliminary and advanced training to the number of aviators the United States must supply within the coming twelve months.

There was also overlooked the fact that to keep five thousand aviators equipped for action, there would be required a rock-bottom minimum average of two thousand aeroplanes of different types per month, or a total of twenty-four thousand machines of different types during the twelve months.

Having overlooked these very important considerations, the authorities could not undertake to supply all the aeroplanes needed out of the twenty-two thousand planned in the July, 1917, program, to be completed by July, 1918. The Italian and Russian reverses created imperative needs, and the authorities received cables requesting thousands of aeroplanes of diffrent types. Lacking the funds necessary to place additional orders, the authorities changed the orders of aeroplanes under construction which they placed, so as to meet the requests from France. As the requests from France and the suggestions from the different Allies were different types of machines, the authorities kept on changing the orders, so as to supply those machines for which there seemed to be the most pressing need. This led to the continual changes which caused the setbacks which have resulted in the aircraft program—which is still the same program made at the time when Italy was victorious and Russia was still fighting—being behind by several months.

Had the authorities been in a position to place additional orders whenever they received cables asking for a given number of machines of a given type, instead of having to change orders for machines under construction, today the original program would be nearly delivered and an additional program would be well under way.

Today we are making the same mistake that was made then. We are stopping the enlisting of aviators, and no steps have been taken to extend the program to meet the new conditions which have arisen, and which, unless they are met properly, may result in Allied reverses.

We have followed the aircraft program step by step and are familiar with the inside problems that have caused the delays. These causes are numerous, but the main ones are:

(1) Lack of concentrated responsibility, authority and control in the management of aerial matters.

(2) Lack of sufficient appropriations to extend the aircraft program to meet the military needs of the Allies.

(3) Lack of touch between the authorities dealing with the strategic side of the war and the authorities having charge of the supplying of aircraft and aviators needed to build American and Allied forces.

(4) The lack of a Government department having the authority and organization necessary to deal with all aircraft matters and prevent delays due to division of responsibility, bureaucratic jealousies and official squabbles over matters of departmental jurisdiction, duplication of efforts, etc. The present Aircraft Board is only an advisory board and has no power to act or to get the necessary organization to extend or carry out an extended aircraft program.

To correct the situation, two successive steps must be taken, as follows:

(1) The immediate appointment of an Assistant Secretary of War and an Assistant Secretary of the Navy to represent the Army and Navy, respectively, in the Aircraft Board. This is to solve the immediate problems while the second step is being taken.

(2) The creation of a Department of Aeronautics based on the British plan, which places the Air Services under a separate Department of Aeronautics, the head of which is independent of, although co-operating closely with, the War and Navy Departments.

The British Government went through every one of the troubles we have gone through in connection with our air service. The official reports of the investigation of the British

Air Service in 1916 shows that there were scandals and charges, counter-charges and confusion, just as we have in the United States today. After three years of trying different plans, the military and naval authorities and other branches of the British Government came to the conclusion that the only solution was a separate Department of Aeronautics, with an Air Minister at the head, whose functions are identical with the duties of the War Minister and the First Lord of the Admiralty.

A separate Department of Aeronautics is the only solution to all the problems of building the air forces needed to win the war.

We must see that many of the officials in charge of the aircraft program and the members of their staffs are able men who, if placed in a Department of Aeronautics and given the power necessary to act and to get together an efficient organization and the necessary funds, will quickly save the situation and enable the United States to do its share in the air this year.

It is well to add that an important consideration that led to the creation of the Air Ministry in Great Britain was the knowledge that Germany is planning extensive aerial mail, express and passenger transportation lines, to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of aircraft. This would give her a reserve air fleet large enough to blow England, France or Italy off the map overnight.

As was brought out in the House of Commons by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. A nation that overlooks this fact may pay dearly for its oversight.

We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids of Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, we must be ready to protect the Republic and the rights of humanity and the Cause of Civilization. To do this will require direct control and supervision of military and commercial air fleets, and this can only be done by a well organized Department of Aeronautics.

Let us emphasize again the necessity of making a national resolution to eliminate minimums of all kinds and adopt maximums in programs, men, appropriations, manufacturing facilities, etc. Having adopted maximums, let us add to each so as to have a substantial margin of safety to insure success under any circumstances.

BELMONT PARK IS LANDING FIELD FOR MAIL SERVICE

BELMONT PARK in New York, Potomac Park in Washington and Bustleton, north of Philadelphia, have been selected by the Postoffice Department for landing fields for the aerial mail service to be inaugurated between the three cities next month. The work of preparing the fields and erecting the hangars will be pushed as rapidly as possible, assuring the inauguration of the service at the latest by May 15, it was officially announced.

The tentative schedules announced by the Postoffice Department give New York the benefit of greatly improved mail service. An aeroplane leaving Washington at noon, as now planned, will reach New York in time to permit a late afternoon delivery throughout the city. To make this delivery by train letters now have to be mailed here before 9 A. M.

The Postoffice Department's official announcement of the new service says:

Work to Be Rushed

"The three landing fields for the aerial mail service have now been selected, and the work of preparing the fields and erecting the hangars will be pushed as rapidly as possible. The service will be in operation not later than May 15. The date of its inauguration may be advanced considerably.

"The three landing fields selected are Potomac Park, for Washington; Bustleton, North Philadelphia, for Philadelphia, and Belmont Park for New York.

"Difficulty was experienced in the selection of a landing site in New York, on account of the high rental asked for a suitable property. The Westchester Racing Association, in a spirit of patriotism, tendered Belmont Park to the Government for this purpose free of charge, and the offer was accepted.

"The hangars at Potomac Park are now in course of construction and the work at Bustleton and Belmont Park will be speedily begun. Extensive rolling and grading of the Philadelphia field is necessary, but the work will all be done during this month.

"Assuming that the aeroplanes leave New York for Washington at noon and leave Washington at the same hour for New York, rail connections for destinations beyond these cities and Philadelphia will be made which would otherwise be impossible.

Much Time Saved

"Besides the saving of much time in the delivery of letters addressed to New York, Philadelphia and Washington, there will be a large time saving through making these connections for earlier trains to the points beyond the terminals. An aeroplane leaving New York at 12 noon, arriving at Philadelphia at 1:30 and at Washington at 3:30, will connect with earlier trains than those conforming to the train schedules from New York for Camden, Atlantic City, N. J.; Paoli, Lancaster, Harrisburg and Chester, Penn.; Wilmington, Del.; Point Deposit, Md.; Cape May, Reading and Pottsville.

Mail arriving at Washington by airoplane at 3:30 would make connections with the Baltimore & Ohio train leaving Washington at 4 P. M. for Cumberland, Grafton, Pittsburgh, Cincinnati and St. Louis. It would also make connection with the Southern train leaving Washington at 4:15 P. M. for Charlottesville, Lynchburg, Danville, Va.; Greensboro, Salisbury and Charlotte, N. C.; Atlanta and Birmingham.

To Gain Eight Hours

"The time saved on these connections would amount to eight hours or more. In order to make these connections by rail it would be necessary for mail to be dispatched from New York at 8 A. M.

"On account of the more frequent train service and different schedules of trains going north the saving of time would not be as great to outlying stations for northbound mail.

"Letters dispatched by air route from Washington will at Philadelphia connect with earlier trains for Trenton, Manunka Chunk, N. J., and East Stroudsburg, Chester, Wilmington, Camden, Atlantic City, Cape May, Reading, Pottsville and Bethlehem.

"At New York earlier connections will be made for Bridgeport, New Haven, Springfield, Boston, Albany, Syracuse, Rochester, Buffalo, Cleveland, Toledo, Elkhart and Chicago.

"An aeroplane leaving Washington on this noon schedule would make the late afternoon city delivery over the entire City of New York. To make this delivery by train letters now have to be mailed before 9 A.M."

"Belmont Park is the ideal New York terminal of the Washington-New York aeroplane mail line," said Messrs. Alan R. Hawley, President of the Aero Club of America and Henry Woodhouse, a member of the Board of Governors of the Club, "and the postal authorities are to be complimented on their wise selection."

"The Aero Club authorities selected Belmont Park in 1910 for the first international aviation meet and found it ideal in every way. By offering the use of Belmont Park to the postal authorities, Major August Belmont, who is an old member of the Aero Club of America, again demonstrates his practical patriotism. This is only one of the many contributions which he has made to advance the cause of national defense in aeronautics.

"The aerial mail carrying project is much closer to the cause of national defense than many people realize. Had the postal authorities been permitted to establish aerial mail lines several years ago, it would have given great impetus to the development of large mail carrying aeroplanes and high-powered motors and we would today have extensive sources of supplies of these machines with which to strike Germany through the air.

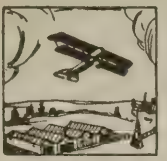
"There would also have been trained hundreds of aviators in cross-country and night flying, which would have given a reserve of trained aviators to use against Germany upon our entry into the war.

"It is highly gratifying that the War Department will co-operate to the fullest extent with the Post Office in rushing these aerial mail lines, using military aviators to pilot the postal aeroplanes, thereby giving the aviators extensive cross-country flying.

"It is an efficient combination, which will develop trained aviators, and at the same time enable New York, Philadelphia, Washington, Camden, Atlantic City, Harrisburg, Wilmington, Boston, Albany, Buffalo, and other cities to get their mail many hours sooner.

"The fact that this one air line increases the efficiency in the delivery of mail in so many cities gives an idea of the efficiency of the aerial mail service and insures establishing other aerial mail lines throughout the United States in the near future.

"There are thousands of aviators who still have to receive their advanced training, and whose training can be combined with the delivery of mail in different parts of the United States."



THE NEWS OF THE WEEK

New Department of Aeronautics is Probable Now

Washington. — Sentiment in Congress is growing fast for a "Department of Aeronautics."

In fact it is more than likely that a bill soon will be introduced providing for such a department with a secretary at its head who will have the same standing as a cabinet officer and authority as both the Secretary of War and the Secretary of the Navy.

Under the present system the Aircraft Production Board may only make recommendations to either the War or Navy Departments which may or may not be carried out in the Signal Corps of the army or the Naval Aviation Service.

Under the proposed department scheme the men now in these two branches of the service would be transferred to the "Flying Corps," which would be a consolidation of both.

When Murray Hulbert, Dock Commissioner of New York, was a member of the House he introduced a bill for the creation of a Department of Aeronautics, but it met with the disapproval of the Administration and was lost. However, it was due to that bill to a large extent that the present Aircraft Production Board was created.

President Names New Aids to Baker

Washington.—President Wilson sent to the Senate April 8 the nominations of Edward R. Stettinius and Frederick F. Keppel, both of New York, to be Assistant Secretaries of War. They will fill two new offices created to carry out plans for placing the War Department on a better basis to carry on the conduct of the war. Both nominations had been forecast.

Mr. Stettinius was a partner in J. P. Morgan & Co., and as such had charge of the purchase of war supplies for the Allies in the United States before the United States entered the war. He is now Surveyor General of Purchases under the Director of Purchases in the War Department. Senators who favored the creation of a War Cabinet of three members cited Mr. Stettinius as the kind of man needed for that proposed body. Dr. Keppel is Dean of the College of Columbia University, New York. He has been a voluntary assistant to the Secretary of War and one of Secretary Baker's most intimate official associates.

Industrial Service Section of Signal Corps Is Created

The War Department authorized the following statement:

The appointment of Charles P. Neill, of Washington, D. C., manager of the Bureau of Information, Southeastern Railways, and former United States Commissioner of Labor, as chief of the Industrial Service Section of the Signal Corps, and of W. Jett Lauck, of Washington, D. C., editor of the *Labor Gazette,* and former mining expert and consulting statistician of the United Sattes Commission on Industrial Relations, as his assistant, completes the War Department's program of creating in each important procuring bureau an organization for the development and maintenance of satisfactory relations between employers and employees engaged in production for the Army.

The sections organized are:

Industrial Service Section of Ordnance Bureau, in charge of Herman Schneider; location, Sixth and B Streets; telephone, Main 2570, branch 449.

Industrial Service Section of Quartermaster Department, in charge of E. M. Hopkins; location, 1800 Virginia Avenue; telephone, Main 2570, branch 2396.

Industrial Service Section of Signal Corps, in charge of Charles P. Neill; location, 161 Woodward Building; telephone, Main 3670.

Industrial Service Section of Construction Division, in charge of Col. J. H. Alexander; location, Seventh and B Streets; telephone, Main 2570.

The work of these sections is being carried on in close co-operation with the Department of Labor and is being co-ordinated through the office of the Secretary of War with the Labor Administration.

Approves St. Louis-Chicago Aerial Route

Postmaster Selph of St. Louis announced that the Postoffice Department had approved his idea for aerial mail service between St. Louis and Chicago, provided suitable landing fields can be found in the two cities. Aeroplanes would leave Chicago and St. Louis simultaneously.

Colonel Montgomery Made Member of General Staff

By direction of the President, Colonel Robert L. Montgomery is detailed as a member of the General Staff Corps for the period of the present emergency. Colonel Montgomery, while discharging this duty, will continue as a member of the Aircraft Board.

Evan J. David Lectures to Baltimore Engineers

Evan J. David, business manager of "Flying" monthly, addressed the Engineers' Club of Baltimore on April 4. Mr. David touched on all phases of aeronautics, beginning with the construction of the aeroplane in the factory, and ending with its destruction over the field of battle.

Wright Buys Indiana Plant

The Wright Aeroplane Company of Dayton, Ohio, has purchased the plant of the Union City Body Works of Winchester, Indiana. This plant will be used for the manufacture of aeroplane parts. Two hundred and fifty men will be employed here.

Standard Aeroplane Gets to Capital in Record Time

A new National biplane flew from Dayton, Ohio, to Washington, a distance of over 700 miles over mountainous country, in little more than eight hours. The aeroplane was constructed by the Standard Aircraft Corporation, equipped with a Hispano-Suiza engine and piloted by R. Bounds.

Navy Uses Liberty Engine

According to information from Washington, the Navy Department has more than 80 aeroplanes equipped with Liberty engines. A Liberty equipped plane on March 28, attained an altitude of 21,500 feet. Announcement was also made, according to "Automotive Industries," that General Pershing has well over 100 combat aeroplanes in his organization. It is not stated, however, that they are of American construction.

At the Aviation Schools

Changing a spark plug in mid-air, while flying near the Curtiss School at Miami, is the feat performed by Joseph Bennett and Paul Bickey. The plug was changed at an altitude of 8,000 feet and flight resumed in less than four minutes.

Richard Mansfield, son of the late Richard Mansfield, who enlisted in the Aviation Section of the Signal Corps in New London, Conn., on February 1 last, died of spinal meningitis at the aviation training camp, San Antonio, Texas. His mother, who was Beatrice Cameron, an actress of distinction, has been so informed.

With Washington as their final destination, Brigadier-General W. L. Kenley, chief of the United States Army air forces, and Major C. K. Rhinehardt, his pilot, prepared to leave Kansas City for Omaha, where the General will inspect the army balloon training camp. The General is making a round of all army aviation camps by aeroplane.

"Simply travelling that way to save time," he said when he and his pilot alighted here after flying from Fort Sill, Oklahoma. They had flown there the day before from San Antonio, Texas.

Rodman Law, balloonist and aeronaut, attached to an aero squadron at Kelly Field, jumped from an aeroplane at a height of 2,500 feet, and with the aid of a parachute, landed safely. He was taken up in an aeroplane by Edward Stinson, an instructor at Kelly Field.

Law is making a series of experiments to demonstrate the feasibility of jumping from an aeroplane. He is a brother of Miss Ruth Law, and Edward Stinson is a brother of Miss Katherine Stinson.

A record has recently been established at the San Diego flying field, where the cadets in training there flew a distance of 35,000 miles in 72 hours without breaking so much as a support on any of the machines.

Royal Flying Corps Going Back to Canada

The British Royal Flying Corps, commanded by Brigadier-General Hoare, which has been training here since October, will soon be starting back to Toronto, Canada. The British, thousands strong, came to Fort Worth and shared the three American fields here at the invitation of the United States Government. It was a return courtesy for the British invitation last summer to the Americans to train in Canada.

The British will not return to Canada in one body—the movement extending over ten days. After the men in the fields have moved out the headquarters staff will go. With the departure of the English, the fields here will be devoted to Americans.

Liberty Motors Being Shipped Abroad

According to "Automotive Industries", 150 Liberty aeroplane engines were shipped abroad during the past week, and more than seventy had been delivered ready for installation, previous to that time.

Major John Purroy Mitchel, former Mayor of New York City, receiving aero engine instruction at an Army flying field

Aeroplanes Aid Liberty Loan

The big Caproni Italian military aeroplane, piloted by Captains Resnati and D'Annunzio, of the Italian Flying Corps, came to Washington from Mineola, N. Y., "bombing" New York city, Princeton, N. J.; Philadelphia and Baltimore on the way with Liberty Loan literature. The officers will remain in Washington a week to aid in the loan campaign. The Captain's machine was accompanied to New York by six American planes, in charge of Lieutenants E. L. Williams, Charles Ludick, E. B. McCullough, E. O. Barr, H. E. Watson and E. W. Kilgore.

The air fleet made its "raid" on Manhattan under the bluest of skies, raining "buy a bond" paper bombs from the financial district clear up to and beyond the Bronx. The air was filled at times with fluttering papers, which looked not unlike autumn leaves tossed about by the winds. Eager spectators even risked injury by surface cars in efforts to clutch the "bombs" before they could touch the ground.

Captain Resnati in his big Caproni caused all to marvel. He circled high above the Woolworth tower and then took a whirl around one of the American machines before he descended to a point north of City Hall Park and skimmed gracefully over the City Hall, doing a ring above the park.

Then he took a higher air path and zipped along the upper strata of Broadway, dropping Liberty bond literature as he flew.

The American aircraft returned to Mineola in single file after flying above and circling high in the air over the city.

Lieutenant Joseph C. Stehlin, twenty-one years old, who, as the youngest member of the Lafayette Escadrille, on Setpember 7 last, fought three Boche battleplanes 17,000 feet in the air behind the Prussian lines, brought down one of them, disabled another and reached his home station in safety, is going to make a series of flights over the State of New York for the Third Liberty Loan.

Instead of firing a machine gun or dropping bombs to destroy Boches he will scatter thousands of Liberty Loan circulars to arouse the people to buy, buy, buy, and keep on buying.

Lieut. Colonel Vincent on Duty at Dayton

The Signal Corps, Aviation Section, has assigned several of the engineers who were identified with the design of the Liberty motor to duty in Dayton, Ohio, with orders to report to Lieut. Colonel Vincent, Mutual Building, Dayton. Among the officers ordered to report are: Major Howard C. Marmon, Capt. Floyd O. Tobey, Capt. Howard E. Blood, Lieut. Ferel O. Replogle, Lieut. Paul Goldsborough, Lieut. T. C. McMahon, Lieut. William Bernhard, Lieut. Maurice S. Shafer, Lieut. Ernest A. Cawcutt, Lieut. Sam L. Roche, Lieut. Miller B. Heebner, Lieut. Francis E. Engerbretson and Lieut. Lionel M. Woolson and Major Alfred Smith.

Red, White and Blue Circles and Stripes to Distinguish American Machines

Red, white and blue circles and stripes will be the distinguishing mark of Uncle Sam's army and navy aeroplanes, the Signal Corps announced.

The wings of the planes will be marked with a red bullseye. The rudders will be marked with vertical red, white and blue stripes.

Major Hitchcock Commands at Minoela

Within one year from the time he first started taking lessons on the field of flying Major Thomas Hitchcock has been put in command of Field No. 1. Major Hitchcock soon developed into one of the best aviators here. His progress won him his license, this was followed by a commission, and within a short time he was made a captain. His ability asserted itself in many ways and he was promoted to a major. He has now been put in supreme command of all the men at the field, where but so short a time ago he was a beginner.

Major Hitchcock had proved an exceptional scholar. There never was a day when the weather was too cold or windy for him to fly. The only thing left to make his happiness complete now is to receive word that his seventeen-year-old son, Thomas, who was downed by a German some time ago in France, is alive and in a prison camp.

Major Hitchcock replaces Lieutenant Colonel Olin Aleshire, who has been assigned to other duties.

Major Rice Heads American Airmen in Battle

Major Cushman A. Rice, of Willmar, Minn., son of a former Minnesota Lieutenant Governor and member of the Aero Club of America, is commanding the American fliers now operating against the Germans in the great battle in France, according to reports reaching here from the front.

Major Rice has been in France only about a month. Washington friends were greatly pleased to learn of the honor conferred on him. They recalled that he repeatedly was turned down by the War Department last spring when he applied for a commission. He was told he was too old, too big to fly and otherwise unfitted for the service. He served in the army in the Spanish-American War. He fought in South American revolutions, was chief of scouts for General Lawton in the Philippines and took part in putting down the Boxer uprising.

Major Rice finally gave up and enlisted as a "buck" private. Throught the efforts of Senator Knute Nelson the War Department finally waived ground school requirements and sent Private Rice to Mineola Flying Field, where he soon became a sergeant and then graduated several weeks ahead of his class. He was recommended for major by the commander of the flying corps, who at that time said he wanted Major Rice for important work in France.

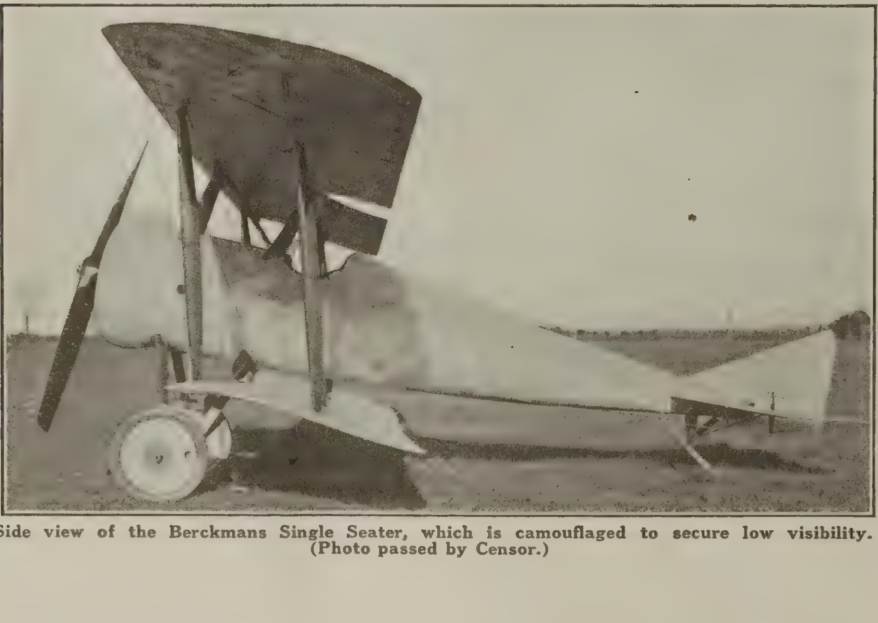
Before going to Europe Major Rice spent sixty days arranging business affairs in Cuba, where he owns a ranch and rice plantation.

Aviation Corps of 500 to Be Contribution of Siam to Allied Cause

An aviation corps of 500 members will be Siam's contribution to the Entente Allies, according to Frank D. Arnold, formerly chargé d'Affairs at Bangkok, who arrived at San Francisco from Siam on his way to Washington.

"The Siamese army has developed some splendid aviators," Mr. Arnold said. "They seem to take naturally to the work under the instruction of French and Italian experts.

"When I left they were preparing to send over 500 men with a complete quota of aeroplanes, all of foreign construction."



Side view of the Berckmans Single Seater, which is camouflaged to secure low visibility. (Photo passed by Censor.)

Carolina Aircraft Company Organized

The Carolina Aircraft Company of Raleigh was recently incorporated with an authorized capital of $500,000 and a paid capital of $20,000. The stockholders are Harry N. Atwood, famous pioneer aviator; Howard White, John A. Park and J. M. Broughton. The first craft is to be completed in sixty days.

Reorganization of War Industries Board

Washington.—Under a plan of reorganization announced April 7 by Chairman Baruch of the War Industries Board, the ordering and delivering of war supplies and the management of the big industrial problem facing the country is to be centralized hereafter with the chairman of the board.

The control of industry and production about to be assumed by the board will involve the questions of national price fixing, international pooling of raw materials and the curtailment and possible elimination of less essentials, in all of which the board will have a directing hand.

The central directing agency in the new scheme is the Requirements Division of the War Industries Board and is headed by Alexander Legge. Upon this the War and Navy Departments, the Shipping Board and Food and Fuel and Railroad administrations each will have representatives.

The needs of all departments hereafter will be submitted to this division, which thus will be able to furnish Chairman Baruch with complete information to guide him in determining the general industrial policy of the country, the organization of production and the relocation of industries.

To take charge of each problem of supply a special commodity section has been created. Each section will have card indexed capacity of every manufacturing plant handling this particular commodity, and its orders. It thus will have at hand all the needed information regarding any desired article coming within its jurisdiction and will be able to make a systematic allocation, according to the relative urgency of the needs of the various departments. For example, should the War and the Navy Departments each want a supply of certain shapes of steel, they will lay their demands before the Requirements Division and their purchasing agencies be told just how much to buy and where to place their orders. Purchases of the Allies will follow the same plan.

At the meetings of the commodities section, at which allotment of materials or facilities to fill the requirements is made the representatives of the various supply departments of the Government who are members of the section will have full share.

If any member of a commodity section is dissatisfied with a decision he may, if he wishes, file a protest with the section head and also with the head of his division or department. Then if, for example, he belongs to one of the Government supply departments, his chief may appeal for reconsideration to the War Industries Board, whose decision will be final, subject only to modification by agreement among the chairman of the War Industries Board and the respective Secretaries of War and the Navy and the chairman of the Shipping Board, whichever may be the one interested in the subject.

In cases where it becomes necessary to control an industry in whole or in part by means of allotments, the appropriate section will determine the allotments of materials, commodities and facilities to the several departments of this Government and to its allies and also the extent to which manufacturers or others, whether serving the civilian population or engaged in the manufacture of war supplies, shall be supplied.

When a commodity section comes to make its full report on the allotment of any specific requirements the chief of that section will notify a member of the priorities division of the War Industries Board to be designated for such purpose by the priorities division, who will, with the section chief and the member, consider and tentatively determine the priority rating which such requirements will take when orders therefor will have been placed.

Such tentative rating will be observed by the priorities committee in connection with all applications for priority on orders covering such requirements unless the priorities committee should (because of conditions changing in the time intervening between the time of the fixing of the tentative rating and the application for priorities or other good cause) conclude such rating to be improper; in which event the section chief and each member of the section fixing the tentative rating will be so notified and have an opportunity to be heard before such rating be changed. In the event a change is made the section chief or any member may appeal from such decision in the manner prescribed by that portion of the organization plan of the War Industries Board governing priorities.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1. Report to points named for temporary duty in the order given.

Note 2. Report to Atlanta, Ga.

Note 3. Report to district manager of equipment, Detroit, Mich.

Note 4. Report to district manager of inspection, 15 Park Row, New York City.

Note 5. To Washington, temporary duty; then Millington, Tenn.

Note 6. Report to director of training, Bedell Building, San Antonio, Tex.

Note 7. Report to departmental aeronautical officer, New York City.

Note 8. Report to Lieut. Edward Howe, 16 Victoria St., Toronto, Canada.

Note 9. Report to Radio School, Columbia University, New York City.

Note 10. Report to Camp Hancock, Ga.

Note 11. Report to War Prison Barracks No. 2 for duty as censor.

A

Abels, Walter Jerome	SLR; DIK
Adams, Alfred A.	SLR; FRF
Archer, Allen Thurmer	SLR; RSD
Atkinson, Harold Kenneth	SLR; RSD
Aldredge, Sawnie Robertson	SLR; KST
Allen, Morton P.	SLR; FRF
Armstrong, John Fisher	SLR; LHV
Amsden, Charles Avery	SLR; AEF
Ashley, Edward E., Jr	CAP
Andrews, William V.	OSU
Allein, Henry C.	FLR; AEF
Auchard, Oliver Cecil	SLR; KST
Archer, Morris	CAP
Ash, Thomas, Jr	FLR; AEF
Acheson, Alexander M.	PFO
Allen, Richard Courtney	SLR; CWT
Andrews, James Bell	SLR; CDT
Appleton, James L.	PFO
Anderson, Richard M.	DIK
Armstrong, William J.	FLR; AEF
Allen, Richard C.	DIK
Anderson, Clarence	DIK
Adams, William Arthur, Jr	SLR
Allen, Charles Edward	SLR
Alton, Robert Leslie	SLR
Aaron, Samuel A.	SLR
Alder, George W.	SLR
Ames, Adelbert, Jr	CAP
Adams, John W.	SLR
Albertson, Edwin R.	SLR
Allison, Arthur Jerome	SLR; PFO
Acheson, John Huyler	SLR; GLC
Armes, Henry Lyman	SLR; GLC
Ashfield, Harvey	SLR; GLC
Aloe, Myron	FRF
Abbott, Louis Hyer	SLR; KST
Adams, James Douglass	SLR; DIK
Anderson, Richard Meriwether	SLR; KST
Annan, Duncan C.	FRF
Adams, John W.	FRF
Allen, Albert D.	FRF
Armour, Philip D.	SLR
Aaron, Samuel A.	FRF

B

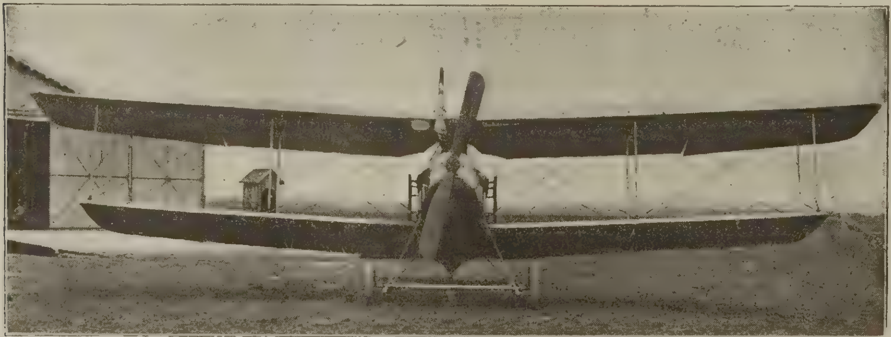
Bloom, Edward Leon	SLR; RSD
Brown, William D.	SLR; CDT
Brown, Egbert DeW.	FLR; CDT
Brown, Robert Houston	SLR; KST
Brown, Harry D.	SLR; FRF
Brown, Harry Baldwin	SLR; TMA
Burton, John F.	FRF
Brunt, Shermer Douglas	SLR; KST
Blanton, Walter Keith	SLR; HHN
Black, Orlando Bacon	SLR; KST
Bedell, Nelson Henry	SLR; HHN
Baxter, Howard Francis	SLR; KST
Boothe, Ross	SLR; HHN
Burr, Richard Olcott	SLR; RSD
Ballard, Homer Ditmar	SLR; EOT
Bell, George Edward	SLR; RSD
Barnard, George Augustus (2d)	SLR; EOT
Barnett, Arthur Rex	SLR; SBI
Berg, Henning Julius	SLR; EOT
Boles, Charles Frank	SLR; SBI
Baker, Robert Lynn	SLR; EOT
Breese, Robert Potter	SLR; HHN
Bolender, Fred John	SLR; TFT
Bacon, Vaughan Robert	SLR; LHV
Bamberger, Raymond S.	MAJ; FOB
Bishop, Miller V.	CAP
Burns, Charles Hugh	SLR; PMT
Brown, Austin Haymond	SLR; KST
Brown, Harry Dugan	SLR; GLC
Browne, Charles E.	PFO
Bown, Ralph	CAP
Burrucker, William C.	PFO
Behrendt, Eugene	CAP
Bahel, Frank	CAP
Bradley, Charles Clarence	SLR; KST
Black, Avery John	SLR; RSD
Burnham, Stanley	SLR; KST
Bradfield, William L.	FLR; AEE
Brazelton, William Lawson	SLR; KST
Bolton, John Hugh	SLR; RSD
Browning, $rving Knox	FLR; PFO
Bowen, Scott Howe	SLR; RSD
Birdseye, Garner Kippen	SLR; EOT
Buell, Llewellyn M.	OSU
Brock, H. Irving	CSO
Barrett, John Minott	SLR; KST
Bentley, Madison	CSO
Birnbaum, Bert J.	DIK
Bailey, Foster	SLR; KST
Blaney, Lewis	FLT
Buckley, Douglas A.	PFO
Badham, Henry L.	FLR; AEF
Bassett, Herbert B.	LHV
Beach, Merritt Stephen	SLR; RSD
Barr, George D.	FRF
Blood, Howard Earl	CAP

Baetjer, Charles H.	CAP
Bailey, Frederick W.	DIK
Branson, Harold W.	DIK
Brownlee, Fred P.	DIK
Burton, Joseph Whitner	SLR; KST
Brady, William T.	FRF
Black, Robert O.	FRF
Boland, Thomas	CAP
Benedict, Robert P.	FRF
Burns, Edward	CAP
Barnes, Paul V.	SLR
Baumberger, Charles A.	SLR
Bradford, Henry E.	SLR
Brainerd, Fred L.	SLR
Branson, Raymond L.	SLR
Bressman, Earl N.	SLR
Buchanan, James D.	SLR
Bughman, Henry C., Jr.	SLR
Burke, Francis X.	SLR
Burke, George F.	SLR
Baker, Alton F.	FLR
Bonnalie, Allen F.	FLR
Buffington, Floyd J.	FLR
Boyd, John P.	FRF
Bibb, John T., Jr.	SLR
Brennan, James D.	SLR
Brooks, John B.	SLR
Behr, Fred Arthur	SLR; PMT
Barrett, Clement James	SLR; PMT
Barnard, Leon William	SLR; CWT
Burrucker, William Charles	SLR; KST
Baker, William Lester	SLR; CAF
Buchanan, James P.	FRF
Branson, Harold Wood	SLR; CWT
Buckler, Douglas Arthur	SLR; KST
Burgher, Ballard Young	SLR; KST
Bowman, Robert H.	SLR; KST
Bonsal, Stephen, Jr.	FRF
Bowen, Claude M.	FRF
Braun, Bruce E.	FRF
Brown, Isaac G.	FRF
Brown, Warren Day	TMA
Browning, Russell I.	FRF
Bailey, Elmer S.	FRF
Banks, Frank	FRF
Barnard, George A., (2d)	FRF
Bimm, Harry L.	SLR
Baird, Harold C.	FRF
Bowles, Walter S.	FRF
Bennett, Horace R.	FRF
Billups, Val T.	FRF
Boley, Austin F.	SLR
Bucklin, William Norris, Jr.	SLR; ELA
Bradley, Lyman Cook	SLR; KST
Baskey, Earl F.	FRF
Baez, Raphael, Jr.	FRF
Boyd, Beveraly M.	FRF
Burke, Hubert J.	FRF
Benham, Reid F.	SLR
Bonnevalle, Richard W.	SLR
Bramhall, Maynard	SLR
Bruner, Donal L.	SLR
Butterfield, Harold H.	SLR
Butterworth, Benjamin T., Jr.	SLR
Brookhauser, Guy W.	TMA
Bancker, William D.	FRF
Brown, Robert J., Jr.	FRF
Buck, Edward H.	FRF
Bradley, Charles E.	FRF
Bailey, William Frederick	SLR; CWT
Birnbaum, Bert Jake	SLR; CWT
Blakely, George W.	FRF
Braun, Arnold W.	FRF
Bloon, Robert B.	KST
Bailey, John William, Jr.	FRF
Bradford, Thomas L., Jr.	FRF
Bratton, Howard, Jr.	FRF
Birkett, Howard	FRF
Buckley, Charles J.	FRF
Brant, Gerald C.	Note 6
Blum, Alexander	SLR; KST
Buhl, Lawrence D.	SLR; KST
Blanchard, Leslie D.	DIK
Bittinger, Howard P.	SLR
Burch, Mark H.	SLR

C

Caldwell, Jobin B.	DIK
Clifford, Paul L.	FRF
Compere, Harold	SLR; RSD
Clark, Marshall G.	DIK
Covington, Harry Stockel	SLR; KST
Crary, Allan Hodgdon	SLR; KST
Clark, John Francis	SLR; KST
Callan, Paul J.	FLR; CDT
Cumming, David R.	FLR; CDT
Case, Ira Hamilton	SLR; TMA
Carley, Clyde Hicks	SLR; TMA
Cross, Albert	FLT; CMV
Carson, William Holmes	SLR; RSD
Coffing, Lawrence Dayton	SLR; RSD
Cox, John Dunlap	SLR; RSD
Cooper, Richard Dwyer	SLR; TFT
Crowell, Reginald B.	SLR; FRF
Crocker, George Augustus, Jr.	SLR; PMT
Cook, Howard Esdel	SLR; PMT
Clevette, Charles Francis	SLH; SBI
Cutts, George Belcher	SLR; DIK
Cudlipp, Jerome Moore	SLR; KST
Carron, William Evab, Jr.	FLR; EOT
Carver, Chauncey B.	CSO
Crum, Gay	SLR; KST
Coulter, William Adams	SLR; RWT
Coppinger, Connor	SGS
Christian, Carleton W.	FRF
Christian, Clarence H.	FRF
Cowgill, Russell Twaddle	SLR; EOT
Coffee, Rector C.	FLR; AEF
Carroon, William E.	FRF
Cousins, William S.	FLR; AEF
Culbertson, Craig	SLR; FOB
Case, Leland I.	FRF
Crisp, James Van D.	CAP
Clements, William T.	FLR; AEF
Callender, Leonard	FLR; PFO
Cotting, Charles E., Jr.	CAP
Carter, Charles F.	FRF
Coyle, Frank J.	DIK
Coulter, William A.	FRF
Cudlipp, Jerome M.	DIK
Coyle, Frank James	SLR; GLC
Colville, Clifford J.	FRF
Carlin, J. Francis	SLR
Charles, William K.	SLR
Charlton, Donald H.	SLR
Cole, Dausa W.	SLR
Collins, Raymond B.	SLR
Crissey, John C.	SLR
Calhoun, Abner W.	SLR
Callaghan, Robert L.	SLR
Carson, Robert H.	SLR
Clark, Wallace T.	SLR
Clarke, DeFrance	SLR
Cox, Leon C.	SLR
Craig, Alexander, Jr.	SLR
Cranford, Joseph O.	SLR
Cranford, Wilbur F.	SLR
Case, Walter E.	SLR
Coachman, James H.	SLR
Cobb, Edgar E.	FLR
Coleman, Richard R.	FLR
Craven, John D.	FLR
Cronin, Edward M.	FLR
Caldwell, Harold B.	SLR
Cameron, David	SLR
Carvin, Charles W.	SLR
Clark, Halford	SLR
Carusi, Joseph S.	SLR
Clark, Marshall Grant	SLR; LDT
Callender, Marshall C.	CAF
Curry, John F.	Note; 6
Castle, Otis H.	SLR
Chapin, Harry T.	SLR
Clanton, Bernie D.	SLR
Cole, Franklin B.	SLR
Comer, Braxton B.	SLR
Crist, Donald L.	SLR
Campbell, Elmer B.	SLR
Campbell, Horace L.	SLR
Carter, Paul B.	SLR
Cheak, Chester W.	SLR
Cooper, Walter W.	SLR
Cole, Charles C.	FRF
Christom, George L.	FRF
Changnon, Dale A.	FRF
Claghorn, James L.	FRF
Cook, Charles I.	FRF
Cannon, Lawrence H.	FRF
Cathcart, Sewall C.	FRF
Crosthwaite, Robert O.	FRF
Caldwell, Jabin Bush	SLR; CWT
Carrick, Spence Summers	SLR; KST
Carroll, Howard H.	SLR; KST
Cleveland, Bruce	SLR; KST
Colt, Russell Griswold	SLR; KST
Campbell, Marston, Jr.	SLR; VBW
Crissey, Sherman Barthollomeou	SLR; CWT
Cruickshank, Colin J.	FRF
Cone, Clarence N.	FRF
Collins, Paul F.	FRF
Conant, Rellis G.	FRF
Chapin, Charles G.	FRF
Churchill, Henry S.	CAF
Cowgill, Russell T.	FRF
Cormack, Joseph Marshall	SLR; CWT
Chilson, Roy W.	SLR; KST
Clancy, Edwin Menefee	SLR; KST
Clark, Ezra Westcote	SLR; KST
Cowell, Charles Lewis	SLR; FLA
Colton, Arthur W.	SLR; KST
Cooper, Robert Berry	SLR; CWT
Connell, Samuel M.	FRF
Cheney, Archibald F.	KST
Curtiss, Frederick W., Jr.	FRF
Cary, Edward A.	FRF
Crane, Oliver P. H.	FRF

Lieut. Theodore Marburg, Jr., of the Royal Flying Corps, has succeeded Major Lord Robert Innes-Ker in charge of the recruiting station in New York.



A Two-seater German Rumpler Battleplane

D

Davidson, Oscar Dean	SLR; EOT
Dey, Donald Mitchell	SLR; KST
Dugger, Eugena Frank	SLR; CWT
Davis, Samuel H.	SLR; FRF
Degon, Elmer Fred	SLR; TFT
Doherty, John Paul	SLR; WFO
Dewey, Maurice John	SLR; EOT
Dickinson, Charles E., Jr.	FRF
Deming, Guy S.	CAP
Dobie, Richard Lee	SLR; KST
de Fremery, Leon	SLR; EOT
Devereaux, Walter B., Jr.	CAP
Delhomme, George Arthur	FLT
Dodds, Hiram Elbert	SLR; RSD
Dudley, Albertus D.	REL; CSO
Dickson, Charles M.	PMT
DeHoog, Raymond Edgar	SLR; CDT
Doherty, James F.	CAP
Dean, Alexander R.	FRF
Dawson, Thomas L.	FLR; AEF
Daves, Oliver R.	FLR; AEF
Dwight, Henry W.	FRF
Dade, Alexander L., Jr.	FLT
Douglas, D. Dwight	CAP
Dole, Arthur, Jr.	DIK
Davey, James J.	DIK
Desson, Leonard J.	FLR
Dillin, Forrest H.	SLR
Dee, Lawrence T.	SLR
DeFrates, LeRoy C.	SLR
Drennan, Walter H.	SLR
Dyer, Edwin L.	SLR
Dilworth, Dewees Wood	SLR; KST
Driscoll, Edgar Joseph	SLR; KST
Dice, Agnew Thomson, Jr.	SLR; WCS; Note 4
Drury, Newton Bishop	SLR; FOB
Delana, Edward K.	FRF
Davis, John E.	FRF
Decker, Kenneth	CAF
Davis, Roy Le Fevre	SLR; KST
Davey, James Joseph	SLR; CWT
Doolittle, James Harold	SLR; RSD
Dahman, Wallace W.	SLR
Dean, John R.	SLR
DeCourcy, William E.	SLR
Duke, Leslie	SLR
Donalds, John E.	FRF
Dounce, Clifford B.	SLR
Dwiggins, Russell H.	FRF
Durkee, Hugh B.	SLR
Davies, John P.	FRF
Drury, Alden M.	FRF
Dudley, John E.	FRF

Dougherty, Francis M	FRF
deFremery, Leon	FRF
Davis, Louis E	FRF
Dunlap, John R	FRF

E

Enright, Walter J	FRF
Edwards, Carl William	SLR; RSD
Eliot, Samuel	SLR; WFO
Enright, John E	CAP
Etheridge, Asa J	CAP
Easley, Sam A	PFO
Englehart, George	FLT
Edler, Raymond C	DIK
Enders, Gordon B	FLR
Eaton, Irving	SLR
Eaton, Leland W	SLR
Eckel, Jacob E	SLR
Eddins, Rufus R	SLR
Edgerton, George W	SLR
Ensign, Ralph H	SLR
Ewing, James C	SLR
Edler, Raymond Charles	SLR; LDT
Edgerton, James C	FRF
Epp, Otto C	FRF
Epperson, Arthur R	FRF
Eggleston, Herbert C	TMA
Ellis, Arthur R	TMA
Ernst, Norman C	FRF
Emory, George N	FRF
Easley, Sam A	FRF
Everett, Charles	Note; 11

F

Farr, Newton C	SGS
Frost, John J	DIK
French, Donald Eakin	SLR; GLC
Frink, Henry Post	SLR; WFO
Forbes, Howell	SLR; FRF
Fleet, Rutherford	HLR; KST
Foster, Henry B., Jr	FLR; CDT
Frazee, Harold David	SLR; GLC
Fields, Curtis Philip	SLR; LDT
Fuller, Willard Perrin	CAP
Fanthom, Murray C	FRF
Freas, Walter Johnson	SLR; KST
Froelich, Hugo Ferdinand	SLR; FOB
Fishel, Harry O	FLR; AEF
Friesen, Ernest Clare	SLR; RSD
Frost, John William	SLR; LDT
Fagg, Fred Dow, Jr	SLR; RSD
Ford, Bernard Waterloo	SLR; KST
Fleet, Reuben H	CAP
Frost, Edward P	FRF
Farnsworth, Augustus D	FRF
Fish, George F	FRF
Foy, William J	FLR
French, Harold S	FLR
Feuchtwanger, Paul J	SLR
Flaherty, Morgan James	SLR
Franklin, John A	FRF
Fraser, Kenneth Gatiss	SLR; DIK
Farish, Stephen Power	SLR; KST
Fuller, Clifford Justis	SLR; KST
Felts, Jess A	SLR
Fisher, Albert L	SLR
Fitch, James C	SLR
Fitzgerald, Edmund, Jr	SLR; KST
Flannery, William Blackman	SLR; KST
Franzheim, Henderson K	FRF

G

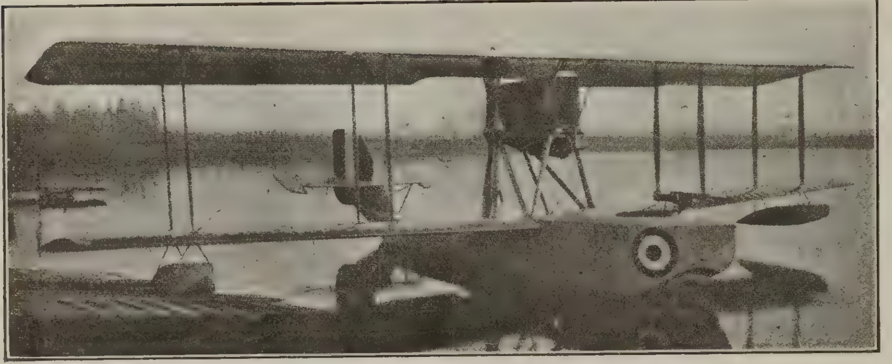
Gordon, Charles	SLR; GLC
Green, Robert Corbould	SLR; GLC
Griffin, Roscoe Charles	SLR; GLC
Gulick, Edward Leeds, Jr	SLR; PMT
Gray, Ralph C	SLR; RSD
Golonsbe, George Jonathan	SLR; RSD
Goodale, Frank W	FOB
Gould, Edgar Russell	SLR; WFO
Griffin, Norval Burris	SLR; WFO
Gallinger, Nathan Kraus	SLR; KST
Gastreich, Joseph W	FLR; CDT
Grimes, David	SLR; KST (2)
Greening, Wendell G	FLR; AEF
Guest, David P	FRF
George, Rob Roy	SLR; TFT
Gibson, James Raymond	SLR; KST
Graham, LeMoyne Reginald	SLR; TFT
Gardiner, Edwin Irene	SLR; KST
Garnier, Edward Wynn	SLR; PMT
Glidden, Charles J	CAP
Grimm, Paul	SLR; BST
Gilmore, Donald Henry	SLR; RSD
Grogg, Russell Isaac	SLR; PMT
Griffith, Fred C	PFO
Gillis, Roger	SLR; ELA
Goos, Carl N	FRF
Graham, Leland J	FRF
Graiezunas, Vytautas A	PFO
Greene, William W	TMA
Gonyo, Clarence F	CAP
Gifford, Lawrence W	FLR; AEF
Garland, Arthur H	SLR
Garner, Jack A	SLR
Gilmore, Otis L	SLR
Green, Harold I	SLR
Guthrie, Harry C	SLR
Gwyer, Kingsley V	SLR
Gregg, David	FLR
Griffith, Robert J	FLR
Gardner, Roy B	SLR
Glenn, Charles E	SLR
Grover, John Hill	SLR
Granville, Bernard R	Note; 5; PMT
Gatch, Nelson B	Note; 7; WCS
Grace, Morgan H	Note; 4
Griffin, William Louis	SLR; HHN
Gally, Thomas Kilburne	SLR; KST
Gifford, Joseph Barney	SLR; KST
Gore, Thomas Edwin	SLR; KST
Ganey, Daniel F., Jr	SLR
Gibson, Edward B., Jr	SLR
Greenwood, Samuel A., Jr	SLR
Griffith, Clyde I	SLR
Gross, Edward H	SLR
Grummey, James M	CAF
Gans, John Edgar	SLR; KST
Gilchrist, Claude F	FRF
Gowan, George	FLR; KST
Geisendorf, Louis C	FRF
Graicunas, Vytautas A	FRF
Gale, Harold D	FRF
Gelwicks, Myles W	FRF
Grantz, Raymond L	FRF
Geisse, John H	FRF
Gilman, Arthur R	FRF

Major W. P. Pearson is commander of the School of Military Aeronautics at the University of Illinois.

H

Harris, Joel G	FRF
Highley, Thomas Hiatt	SLR; KST
Hawke, Clarence Ewart	SLR; WFO
Hamilton, Mark Armistead	SLR; KST
Hendrickson, Charles John	SLR; WFO
Hightower, Charles Daniel	SLR; KST
Harding, Noah	FLR; CDT
Harvey, George Washington	FLR; CSO
Hill, Glenn R	FLR; CDT
Hart, Carl Hugh	FLR; VBW
Horter, Edward M	FLR; CDT
Hoffman, Albert J	LDT
Haack, Theodore Theophil	SLR; TMA
Holt, Robert Harold	SLR; ELA
Hillman, Alfred Daniel	SLR; KST
Hudgins, William Harkinson	SLR; LHV
Harris, William Larue	SLR; DIK
Harrell, Samuel Cheatham	SLR; EOT
Higgins, Curt Elwood	SLR; PMT
Hamilton, Clyde Marion	SLR; HHN
Himebaugh, Gero Albert	SLR; RWT
Malligan, Henry Martin Joseph	SLR; BST
Hamlen, Robert Cushing	CSO
Hogan, Clark Harvey	SLR; HHN
Howard, James G. L	SLR; FRF
Huston, Aubrey	SLR; LHV
Hilliard, Landon	SLR; CWT
Harwood, Archibald Roane	SLR; BST
Heqembourg, Theodore Marsh	SLR; EOT
Hays, Frank Kerr	SLR; KST
Haskins, Charles Herbert	SLR; KST
Ham, David Harvey	SLR; FOB
Huser, Thomas Everett	SLR; LHV
Haller, Hubert George	SLR; TFT
Hoare, John L	FRF
Harding, Paul Curtis	SLR; FOB
Hadley, Hamilton	CAP
Harriman, Walter F	DIK
Hughes, Francis F	DIK
Houghteling, William	CAP
Hostetter, Wilbur Dawson	SLR; GLC
Hitchcock, Thomas	MAJ
Hyman, Joseph H	CAP
Holmes, Wayne M	CSO
Himebaugh, Gero A	FRF
Hitchcock, Reuben	MAJ
House, William Russell	SLR; RSD
Hughes, Francis Forrest	SLR; KST
Horrell, Camden Riley	SLR; RSD
Hensley, James Willard	SLR; FOB
Hall, Levi Marion	SLR; CDT
Hanks, Stedman S	FRF
Host, Thomas Parker	SLR; RWT
Howard, James G. L	SLR; GLC
Heron, Percy Hotspur	SLR; KSR
Harbeck, Edward V	SLR; FRF
Hardin, Ray Stephen	SLR; PMT
Hogan, William A	FRF
Hostetter, Wilbur D	DIK
Holt, Henry E	CAP
Hooper, Edwin Majjox	SLR; FOB
Hoffman, Charles B	FRF
Harvey, Frederick H	CAP
Heath, Hamlin Russell	SLR; KST
Host, Thomas P	FRF
Helms, Leslie R	FRF
Harmon, Frank H	DIK
Hopkins, Rees	SLR
Harkins, Harry H	FLR
Heater, Charles L	FLR
Heinsohn, Augreau G	FLR
Holden, Kenneth H	FLR
Horton, Frederick W	FLR
Hudson, Henry B	FLR
Harris, Charles L	SLR
Hart, Marion F	SLR
Henzy, Urban L	SLR
Herlihy, Harold W	SLR
Hoffman, Jacob V	SLR
Hogen, Frank G., Jr	SLR
Hosmer, Fred E	SLR
Hollaman, Frederick T	SLR
Hook, Sidney B	SLR
Harris, Joel G	DIK
Harmon, Frank Harry	SLR; KST
Hager, Daniel I	SLR
Hardy, Richard L	SLR
Henry, William L	FRF
Hill, Armistead B	FRF
Hequembourg, Theodore M	FRF
Hopkins, Lionel P	FRF

Group of aviation officers. Left to right: Lieut. R. E. Fields, commander of the 38th Squadron, Lieut. E. W. Lewis, supply officer, Chanute Field; Lieut. Dodds, Lieut. H. M. Smith, and Lieut. Harry Winner, commander of the 203rd Squadron.



The Savoia 168 H. P. Reconnaissance Flying Boat. (Italian Official Photo.)

Hartline, William R.	FRF
Horne, George W.	FRF
Hayden, Thomas Heller	SLR; DIK
Henderson, Justin	SLR; KST
Hosman, Everett Mills	SLR; KST
Hugus, Z. Zimmerman	SLR; KST
Hansen, Harry L.	FRF
Hollingsworth, Frank E.	SLR; FRF
Harwell, Gordon L.	FRF
Hicks, Leo R.	SLR; HHN
Harrison, George A.	SLR
Harrell, Samuel C.	SLR

I

Inglesby, Joseph Edmund	FLR; CDT
Ingle, Joseph Lombard	SLR; RSD
Isham, Howard Fuller	SLR; JRC
Ison, Nathaniel B.	FRF

J

Johnson, Gordon E.	DIK
Johnson, Charles Cousins, Jr.	SLR; KST
Johnson, Howard Henry	SLR; LHV
Johnston, Edward McKeehan	SLR; KST
Johnstone, Edwyn	FLR; AEF
Jeffries, John M.	SLR; FRF
Jeffries, Simeon Jackson, Jr.	SLR; RSD
Jackson, Norris Dean	SLR; KST
Jaenke, William D.	FRF
Jones, Montgomery Osborne	SLR; CWT
Jones, Fred Lemuel	SLR; RSD
Jones, Lee Bryan	SLR; FOB
Jones, George W.	CAP
Jones, E Lester	LTC
Jackson, Joseph W.	FRF
Jacobson, Chester J.	DIK
Judge, Joseph Bermingham	SLR; RSD
Jenks, Frederick Angier	SLR; LHV
Jelly, James J.	DIK
Jolly, James Stuart	SLR; GLC
Jefferson, Theodore	FRF
Jackson, Joseph W.	FRF
Jaenkle, William D.	DIK
Jepson, Walter C.	FLR
Jackson, Byron, Jr.	SLR
Jackson, Perry B.	FLR
Johnson, Harold McC.	SLR
Junk, Fred H.	SLR
Johnson, Rollin George	SLR; KST (2)
Johnson, Elmo G.	FRF
Jacob, William C.	FRF
Johnson, Gordon Earl	SLR; CWT
Jones, Christopher L.	FRF
Jones, Russell G.	FRF
Jones, Edward D.	FRF
Jenkins, Burris A., Jr.	FRF
Jack, Butler, Jr.	SLR
Jacobi, George N., Jr.	SLR
Johnston, John W.	SLR

K

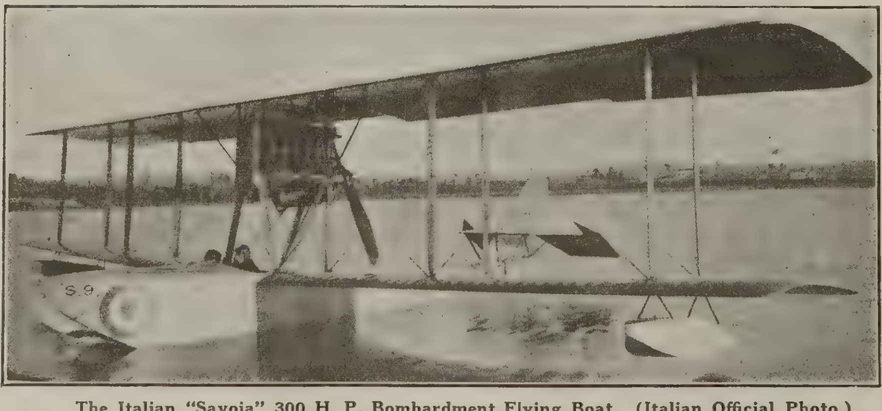
Kanitz, Edwin C.	FRF
Koontz, John N.	FLR; AEF
Koontz, Leonidas Lee	SLR; KST
Kelly, Frank Vincent	SLR; LHV
Kelly, Edward Rudolph	SLR; RSD
Kindred, Herbert LaFayette	SLR; KST
Kemp, Louis Wiltz	SLR; PMT
Kite, Warren Powers	SLR; KST
Knight, Arthur Draper	SLR; TFT
Kirkpatrick, Oran Gould	SLR; KST
King, Gelston Tyler	SLR; EOT
Kilburn, Harold E.	PRC
Kilburn, James B.	CSO
Kaplowitt, Mack Byron	SLR; KST
Kellegrew, Edward Wells	SLR; ELA
Kruss, Edmund Andreas	FLR; RSD
Knapp, Robert Duane	SLR; RWT
Kunkel, Erick James	SLR; LHV
Kirkby, George Phillip	SLR; KST
Kear, Charles E.	FLR; CDT
Kennedy, Donald B.	FRF
Kincade, Franklin P.	MIT
Kirkpatrick, Stewart Ray	SLR; FOB
Keller, Frederick William	SLR; RSD
Kingsland, George Dudley	SLR; FOB
Kimball, Dan Able	SLR; RSD
Keys, John F.	SLR; CDT
Kreis, Stanley Arthur	SLR; KST
Kober, Edward Irving	FLR; CDT
Kelly, Fred W.	DIK
Kittell, Mellan F.	FRF
Kennedy, David S.	FRF
King, Ivan R.	PMT
Kerr, George Reed	SLR; LHV
Kelly, Robert A.	FLR; AEF
Krause, James W.	FLR
Knudsen, Herluf A.	MIT
Kelly, Fred Warren	SLR; GLC
Kinney, Morris	FRF
Kelly, Martin P.	FLR; AEF
Kennedy, Frank E.	FRF
Kiler, John Q.	DIK
Keeney, Charles C.	SLR
Kelso, Fred O.	SLR
Kent, Warren T.	FLR
Kincaid, James B.	FLR
Knowles, Maurice N.	FLR
Keys, Arthur A.	DIK
King, Paul A.	DIK
Kendall, Edward Hale	SLR; TFT
Kalmbach, William Benjamin	CAP
Kanitz, Edwin C.	DIK
Kirkpatrick, Richard J.,	FLR; TFT; CAF; Note 1
Kunkel, Frederick Eugene	SLR; KST
King, Paul Arthur	SLR; CWT
Kelleher, Melvin B.	FRF
Kugler, Martin B.	FRF
Kelly, Sherwin F.	FRF
Kenney, Parker J.	TMA
Kroll, Harry David	SLR; KST
Knight, James K.	FRF
Kesler, Leland W.	SLR
Kahl, Charles A.	SLR
Kingsley, Charles	SLR
King, Gelston T.	FRF

L

Lawson, Oliver Morrison	SLR; FRF; GLC
Larsen, Chauncey M.	FRF
Luce, Raymond Philip	SLR; RSD
Lloyd, Lawrence Albion	SLR; CWT
Lycan, William J. B.	SLR; KST
Lathrop, Fred Burr	SLR; TFT
Lenihan, William Stanislaus	SLR; TFT
Lindsey, Harold	SLR; DIK
Lange, Richard	FRF
Lee, Bernard Wyman	SLR; HHN
Ludwig, Nicholas Henry	SLR; TFT
Lund, William J.	SLR; WFO
Lowry, Swift Miller	SLR; KST
Loening, Albert Palmer	CAP
Lowry, Hal Marmaduke	SLR; KST
Lawrence, Dudley B.	REL; UIU
Langston, James Argile	CAP
Linder, John E.	FRF
Liles, James Franklin	FLR; AEF
Linkenauger, Ernest	SGS
Larned, John Hawley	CAP
Lawyer, Samuel Edward	SLR; GLC
Littlefield, Henry M.	SLR; LDT
Lewis, Halstead H.	DIK
Lomax, Thornton Garland, Jr.	SLR; KST
Lucas, Philip Dearborn	SLR; KST
Lownsbery, Gay T.	DIK
Lasell, John W.	FRF
Lobdell, Jacob Karl	SLR; RSD
Long, Leonard F.	SLR; PFO
Lautz, Theodore V. V.	DIK
Lawyer, Samuel E.	DIK
Lazar, Eugene	MAJ
Lewis, Leroy D.	CAP
Langley, John A.	FRF
Landes, Henry B.	SLR
Liebes, Arnold L.	SLR
Lodewyck, Arthur G.	SLR
Lundeen, Arthur	SLR
Logan, Henry Patrick	SLR; KST
Larcomb, Richard C.	FLR
LeRoy, Clair H.	FLR
Lewis, Arthur L.	FLR
Leyson, Burr W., Jr.	FLR
Loomis, Henry S.	FLR
Little, Frederick E.	SLR
Lehr, Robert Phillip	SLR; FOB
Lundquist, Harry Melvin	SLR; RSD
Lewis, Halstead Harden	SLR; KST
Lassiter, Glenn Robert	SLR; FOB
Lewis, Thomas J.	CSO
Lewis, Chauncey Glenn	SLR; KST
Lownsbery, Guy Templeton	SLR; KST.
Leffler, Claude William Skilling	SLR; CWT
Long, Leonard Franklin	SLR; KST (2)
Loud, Harold E.	FRF
Lee, John C.	SLR
Leek, John B.	SLR
Lesher, Carl R.	SLR
Lyon, Alfred J.	FRF
Liebhauser, Edgar A.	FRF
Littlefield, Henry M.	DIK
LaBoiteaux, Andrew J.	FRF
Lenox, William J., Jr.	FRF
Long, Carl C.	FRF
Law, Hugo B.	FRF
Lee, Zanna P	FRF

M

McMichael, John H.	FRF
McGinley, John Joseph	SLR; HHN
McHenry, Arthur James	SLR; RSD
MacLaughlin, Thomas Greennwood	SLR; FOB
Massey, Raymond Rufus	SLR; CWT
Murphy, Edward Joseph	SLR; KST
McLellan, Hiram John	SLR; LDT
McKoy, Francis K.	DIK
Mulvihill, Mead J.	FRF; DIK
Murray, Charles W.	FRF
Merrick, Louis M.	FRF
Magee, David W.	PFO
McHenry, Arthur J.	PFO
Meyer, Adolph Henry	SLR; SMM
Mason, Ernest John	SLR; EOT
Morris, Wistar	FLR; AEF
Mills, John K.	REV; CSO
McCormick, Francis Howard	SLR; PMT
Moore, William Etstell	SLR; GLC
Meehan, Timothy E.	FRF
Maranville, Clarence H.	MAJ
Mackall, Porter A.	CAP
McMath, Robert R.	CAP
Miller, Leo J.	DIK
Martin, David M.	FRF
Metcalf, Arthur Boyd	SLR; KST
McCall, Carlton Cook	SLR; LDT
Moisant, Stanlie John	SLR; RSD
McArthur, Emmett King	SLR; FOB
Martin, Howard Charles	SLR; RSD
Matthews, William	FLR; AEF
McPeak, Normal B.	PFO
Morison, James C.	PFO
Moulthrop, John Robert	MAJ
Mahler, Herbert P.	DIK
Morrissey, Raymond A.	DIK
Morey, John Davis	CAP
Mitchell, Raymond Ashton	SLR; RSD
Magee, David Willis	SLR; RSD
Manning, James F., Jr.	FLR; AEF
Moses, Lester E.	SLR; PFO
Montagne, Alfred August	SLR; RSD
Mahool, James S.	CAP
Mann, Merrill D., Jr.	FRF



The Italian "Savoia" 300 H. P. Bombardment Flying Boat. (Italian Official Photo.)

MacDonald, James E.	DIK
McLellan, Hiram J.	DIK
Moore, William E.	DIK
Marshall, Willis M.	DIK
McCoy, John Wesley	SLR; AAD
McGraw, John Edward	SLR; RSD
McParland, Norman Dillon	SLR; HHN
McDonnell, Edwin Alexander	SLR; KST
McClure, Colin Barr	SLR; GLC; FRF
McWhorter, Ray Seely	SLR; KST
McCormick, John Brokaw	SLR; RSD
McDoneul, Edwin A.	SLR; FRF
McPeak, Norman Bernard	SLR; CWT
McCurdy, John Anderson	SLR; KST
Macaulay, Theodore C.	FRF
MacMichael, John Henry, Jr.	SLR; RWT
MacDonald, Neil Charles	SLR; BST
Murray, John Joseph	SLR; TFT
Menefee, Jesse Irving	SLR; KST
Moore, Charles F.	FLR; AEF
Merrill, Leland Hawthorne	SLR; LHV
Martin, Charles Jay	SLR; KST
Meyer, Charles Frederick	SLR; KST
Malmgren, Carl Ephraim	SLR; DIX
Mixter, Samuel	OSU
Misfeldt, George William	SLR; KST
Mullineaux, Lester Ray	SLR; CWT
Munroe, James Stewart	SLR; KST (2)
Murphy, John Patrick	SLR; KST (2)
Maurer, William Ritschy	SLR; KST
Morgan, William Victor	SLR; RSD
Monteith, Charles Norton	SLR; KST
Mahnken, Walter Rudolph	SLR; TFT
Matthews, George Berrien	SLR; PMT
Miller, Walter B.	SLR; AEF
Mahler, Herbert Philip	SLR; FRF
Mellor, Lloyd Eldon	SLR; KST
Mahler, Herbert Philip	SLR; GLC
Morris, William Cobb	SLR; RSD
Michels, Joseph Stephen	SLR; DIK
Miller, Henry J. F.	LHV
Mohrman, Louis Grupe	SLR; RWT
Meany, John W.	FRF
Moore, Herve C.	SLR; DIK
Metcalf, Harry H.	FRF
Moon, Charles Morris	SLR; KST
Markham, Robert Benjamin	SLR; KST
Mack, Walter R.	SLR
Mentzer, John W.	SLR
Mitchell, George W.	SLR
Mansfield, John Clark	SLR; TFT
Morrison, Walter F.	SLR
Maloney, Charles P.	FLR
MacWhirter, Donald	SLR
Mann, Alfred C.	SLR
Moody, Corbitt L.	SLR
McCook, Forrest T.	FLR
Mulle, Harold D.	FLR
Montgomery, James Evans	SLR; DIK
McCormack, Victor A.	SLR; BST
Merrill, Keith Bartlett	SLR; KST
Marsh, Albert Ernest	SLR; KST
Markel, Charles H.	FRF
Murphy, Gerald Clery	SLR; CGC
Meinzer, Fred Henry	SLR; KST
MacDonald, James Eugene	SLR; LDT
McFeely, Joseph	SLR; KST
Mason, Ernest J.	FRF
McKenzie, Robert Roderick	SLR; KST
Mann, Walter Louis	SLR; KST
Mayer, Walter Jacob	SLR; KST
Moore, Herve C.	SLR; CAF
Miller, George A.	FRF
Morgan, Paul Victor	SLR; KST
Mann, Merrill D.	SLR; FRF
Mahler, Herbert F.	SLR; CAF
Meyers, Harold	SLR; FRF
MacFadden, Willford, Jr.	FRF
Melick, Paul K.	FRF
Morris, Roy K.	FRF
MacKenzie, Clyde C.	FRF
McGovern, John E.	SLR
Morgan, Stuart A.	SLR
Morris, Edward S.	SLR
Munson, Clinton G.	SLR
Mayer, Henry	SLR
McKnight, James A.	FRF
Mulvihill, William H.	FRF
Massey, Raymond R.	DIK
Maynz, Theodore	FRF
Myers, Franklin D.	FRF
McDuffee, William S.	FRF
Miller, Roy G.	FRF

N

Nimocks, Robert G.	FRF
Nelson, Thomas Edward	SLR; TFT
Nelson, Fred Cyrus	SLR; KST
Newbold, Edwin E.	CAF
Nolan, Edward James	SLR; KST (2)
Neely, Harold R.	FRF
Nelson, Theodore	SLR; FOB
Nolker, Herman William	SLR; FOB
Norton, Paul Thornley	SLR; DIK
Newman, Robert Edmund	SLR; AAD
Nicol, Carlisle F.	FLR; AEF
Nimocks, Robert G.	DIK
Nichols, Luther A.	DIK
Newman, Carl Emory	SLR
Nevius, Ruliff	FLR
Nance, John T.	DIS
Nicholson, Knox Willard	SLR; PFO
Norris, Byron Bacon	SLR; KST (2)
Nordeen, Ansel G.	FRF
Nugent, Leo J.	FRF
Neal, Paul M.	FRF
Nowlen, Stanley	FRF
Norton, Henry Kittredge	SLR; KST
Nugent, Daniel Casey, Jr.	SLR; KST
Nutt, Clifford C.	FRF
Niles, Edward A.	FRF
Neely, Forest H.	FRF
Nelson, Sinius J.	FRF
Nelb, Alfred W.	SLR
Nichols, Brayton	FRF

O

O'Meara, Cornelius Smyth	SLR; KST
O'Neil, James Huson	SLR; SMM
O'Brien, Raymond Henry	SLR; KST (2)
O'Reilly, Paul Leo	SLR; RSD
O'Flaherty, Daniel Vincent	SLR; KST (2)
O'Brien, Maurice Francis	SLR; EOT
Olds, Edward Clarence	SLR; KST (2)
Ott, Lambert, Jr.	SLR; KST (2)
Osborne, Henry Plant	SLR; KST (2)
Olsen, Eugene Field	SLR; KST
Olsen, Clarence A.	FRF
Olson, Horace Edsall	SLR; GLC; FRF
Ordway, William Floyd	SLR; RSD
Onatavia, Thomas L.	FLR; AEF
Osborne, Charles L.	FLR; AEF
O'Melveney, Stuart	SLR; ELA
Oliver, Robert S.	FRF
O'Connor, William J.	LHV
Olin, Robert N.	SLR
Orlob, Rudolph	SLR
Orr, Harry B.	SLR
O'Brien, Robert E.	Note 2; WCS
Olson, Charles Willard, Jr.	SLR; KST
Olsen, Horace E.	CAF
O'Brien, Matthew H.	FRF
O'Brien, Maurice F.	FRF
O'Neil, James J.	FRF
Overholt, George T.	FRF
Owen, Maurice C.	SLR

P

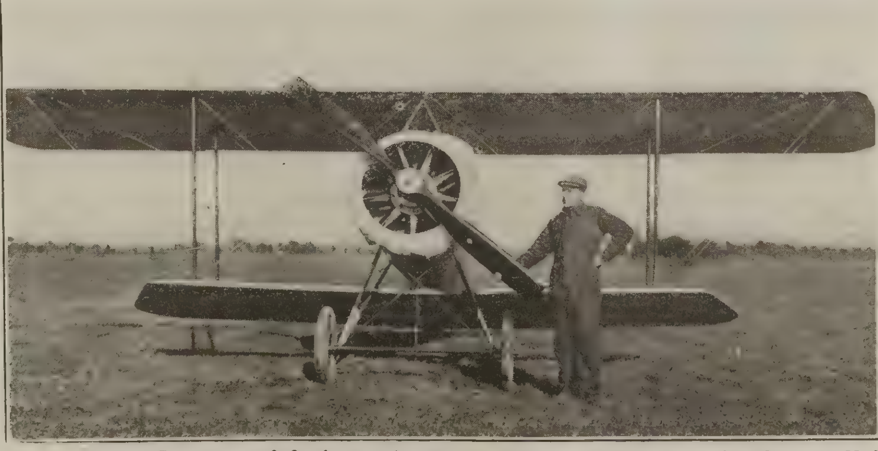
Polk, George Washington, Jr.	SLR; KST
Pike, Vernon Bender	SLR; KST (2)
Peters, Sydney Van Wyck	SLR; RSD
Petree, Leo Webb	SLR; KST
Pendleton, James Dudley	SLR; KST
Parrish, John E.	SGS
Palmer, Ralph Warren	SLR; KST (2)
Pratt, George White	SLR; CSO
Presley, Curtis E.	SLR; DIK
Parker, Ashton	SLR; KST (2)
Powell, Edward M.	SLR; DIK
Price, Stuart E.	SLR; KST
Perry, William Leslie	SLR; RSD
Pardy, George William	SLR; DIK
Pursley, Charles Addison	FLR; CDT
Pearson, James Arthur, Jr.	SLR; LHV
Powell, George	CAP
Peabody, Howard Bell	SLR; RSD
Poillon, Richard	CAP
Parkhurst, Amos James, Jr.	SLR; FOB
Philbrook, Philip Edwin	SLR; FOB
Pratt, Clifford Vincent	SLR; FOB
Prem, Frank Herbert	SLR; KEST (2)
Post, Speed L.	DIK
Pynn, Leander Giles	SLR; SMM
Pettus, William B.	CAP
Powell, Howard H.	CAP
Purdy, George William	SLR; DIK
Philbrook, Jacob Brayton	SLR; RSD
Penberthy, Paul	SLR; RSD
Paden, Robert W.	SLR
Peik, Paul G.	SLR
Perry, Merrill G.	SLR
Peterson, John A.	SLR
Powell, Garland W.	CAP
Pooler, Joseph E.	SGS
Parrish, Joseph A.	FLR
Paskill, Reuben L.	FLR
Pattison, Walworth P.	FLR
Peterson, Percey C.	SLR
Petrilli, John M.	SLR
Phillips, Michael J.	SGS
Pascoe, William H.	FRF
Philbrick, Fred	FLR; AEF
Berry, William L.	PFO
Pond, Richard E.	FRF
Paige, Clarence G.	FRF
Page, Frank A.	FRF
Presley, Curtis E.	FRF
Parker, Robert MacDonald	SLR; RSD
Parker, Albert Nelson	SLR; LDT
Parker, Roy C.	FRF
Parsons, Jay H.	FRF
Power, Hugh C.	SLR; FRF
Purcell, William L.	SLR; FRF
Phillips, Robert F.	SLR
Pendleton, Talbot T.	FRF
Phelps, Richardson	SLR; KST
Parmer, Oscar S.	SLR; FRF
Painter, Parker	FRF
Peterson, Tenny C.	FRF
Page, David G.	Note 3; WCS
Palmer, Paul E.	Note 10; FLR
Pierce, Hugh Marion	CAP
Peterson, Harold G.	FRF
Peck, Lott M.	SLR

Q

Quina, Marion A., Jr.	FLR

R

Richardson, Elbert L.	LHV
Richardson, Ross Theron	SLR; SMM
Rogers, Emery H.	SLR; DIK
Ruid, Guy Kendrix	SLR; KST
Reynolds, Watkins Wendell	SLR; TFT
Rafeld, Max Louis	SLR; LHV
Rolston, Brown	SLR; KST
Randall, John F.	FLR; AEF
Royall, John Edwin, Jr.	SLR; KST
Rorick, Estell H.	SLR; DIK
Russ, Leon Fair	SLR; KST
Royle, William H.	FLR; AEF
Rivers, Walter Ben	SLR; RWT
Ray, Wilmer	SLR; KST (2)
Rudolph, Jacob H.	CAF
Reddy, Philip Jerome	SLR; SBI
Ridgeway, Erwin Tatum	SLR; KST
Rowe, Ralph S.	FRF
Roberts, Carroll Harry	SLR; EOT
Richmond, Arthur L.	CAP
Reed, Harvey Swartley	SLR; LDT
Reid, Charles A.	CAP
Russell, Laurence L.	SLR; FRF; RWT
Rogers, Franklin Lewis	SLR; LDT
Roadhouse, Wilbur	SLR; DIK
Royce, Walker Wirt	SLR; RSD
Roberts, Roscoe Owen	SLR; EOT
Rothfeld, Lawrence	SLR; AAD
Rinehart, John B. G.	SLR
Robinson, Bernard B.	SLR
Rockstroh, Frederick C.	SLR
Rowe, John A.	SLR
Riley, Sidney A., Jr.	SLR
Robinson, Malcolm G.	SLR
Rogers, Lee H.	SLR
Rogeri, Newton C.	FLR
Ryan, Martin A.	FLR
Roth, Archie Frederick	SLR; GLC
Ranklin, John W.	SLR
Reiss, George S.	PFO
Ristig, William B.	FRF
Roth, Archie F.	DIK
Reardon, Oliver A.	FRF
Robinson, Charles McKinley	SLR; DIK
Robinson, Clark	SLR; FRF
Richardson, Durston G.	SLR; CAF
Roberts, Roscoe O.	FRF
Roberts, John W.	SLR
Roberts, Carroll H.	FRF
Rothenberg, Elmer E.	SLR
Rogers, Thomas Carter	SLR; PFO
Rogers, Frank W.	SLR
Regan, Charles Daniel	SLR; KST
Rowland, John C.	FRF
Ridling, Little	FRF
Ridley, Oscar T.	FRF
Royer, James A.	FRF
Ronne, Edwin M.	FRF
Rice, Hugh M.	FRF
Reis, John B.	FRF
Roane, James F.	FRF



The Berckmans Scout, one of the fastest American aeroplanes. It is equipped with a 100 H. P. General Vehicle Co.'s Gnome engine. (Photo passed by Censor.)

DIMENSIONS OF STEEL TUBE STRUTS

By CARLO MAURILIO LERICI, Electrical and Aeronautical Engineer

Special Correspondent for Aerial Age in Italy

THE accompanying graphs have been prepared in order to facilitate the calculation of the dimensions of such circular and streamline steel tubes as are employed in aeroplane construction. The diagrams give directly the compression permissible for a maximum load of 10 kg. per sq. mm. (13,750 lbs./sq. in.); that is to say, with a factor of safety of six for steel commonly employed having an ultimate strength of 60 kg. per sq. mm. (82,500 lbs./sq. in., or nearly 37 tons per sq. in.). The streamline section tube is that of minimum resistance (Fig. 1), tested by Eiffel and adopted as standard by nearly all the constructors of the world. The fineness ratio of this section is about 3. The ratio of the two moments of inertia I_{xx} and I_{yy} is about 5. It will be easily seen that there is an almost constant relation between strength in compression of circular and streamline steel tubes.

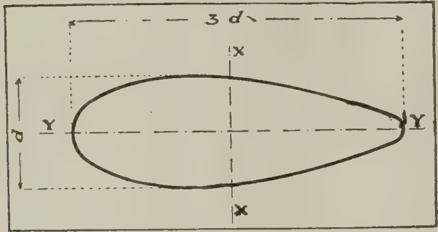


Fig. 1.—Standard section for streamline steel tube.

For the standard type (Fig. 1) I have found that the streamline tube whose section has the external dimensions $d \times 3d$ has the same compressive strength as a circular section tube of the same length and thickness (gauge), having an external diameter = 1.5 d. This factor has formed the basis for the graph (Fig. 2). The following data are given: W = normal compressive load, L = length of tube. The graph shows that for each value of W there are generally several solutions according to the different values of the thickness adopted. In this connection it should be noticed that, in order to attain maximum lightness, one should adopt the minimum possible thickness s. The ratio of s to d should not be less than 1/30.

It should also be pointed out that the condition of minimum weight for streamline tubes exposed to a current of air, as the struts of an aeroplane, is only convenient in machines having a low flight speed. Generally it is possible to so dimension these tubes as to render minimum the power absorbed by their weight and by their head resistance. In the best of modern high-speed machines the total power P absorbed by one meter of streamline tube exposed to the air is given by the formula:

$$P = \frac{dv^3}{10^6} + \frac{34vds}{10^4} \qquad P = \frac{7.25dv^3}{10^8} + \frac{7.85vds}{10^3}$$

d in cm.
s in cm.
v in metres per second.
d in inches.
s in inches.
v in ft./in.

An examination of this formula gives the following results: (1) For machines having a speed of not more than 120 km. per hour (75 m.p.h.) the minimum value of P is obtained by giving the struts a thickness of between 0.8 and 1.6 mm. ($\frac{1}{32}$ in. and $\frac{1}{16}$ in. respectively). (2) For machines of which the normal speed varies between 120 and 100 km. per hour (75 and 100 m.p.h.) the optimum thickness varies between 1.2 and 2 mm. ($\frac{3}{64}$ in. and $\frac{5}{64}$ in.). (3) For speeds between 160 and 200 km. per hour (100 to 125 m.p.h.) the optimum thickness varies from 1.6 to 2.4 mm. ($\frac{1}{16}$ in. to $\frac{3}{32}$ in.). (4) For speeds above 200 km. per hour (125 m.p.h.) the struts should be given the maximum possible thickness, weight having no longer any appreciable influence.

It sometimes happens that one has to depart from these dimensions giving maximum efficiency in order to avoid during flight every vibration that might diminish the compressive strength of struts. For instance, this happens when the frequency of the struts' proper vibration under normal load coincides with or is a multiple of the number of revolutions of the motor. Such a phenomenon of resonance can be countered by modifying one of the dimensions s or d.

The following examples show the method of using the graph:

(1) *Centre Section Strut.*—Streamline section. Steel of 60 kg. per sq. mm. (82,500 lbs. per sq. in.). Factor of safety = 6. Length, 7 ft. Compression in strut, 670 lbs. Thickness $s = \frac{1}{16}$ in. From the diagram it will be seen that the circular tube has an external diameter of 36 mm. ($1\frac{7}{16}$ in.). Streamline tube having same strength, d = 36:1.5 = 24 mm. ($\frac{61}{64}$ in.). As the fineness ratio of the strut is three, the dimensions should be about 1 ft. 3 ins.

(2) *Chassis Strut.*—Streamline section. Steel, 60 kg. per sq. mm. (37 tons per sq. in.). Factor of safety, 6. Length 5 ft. Compression under nomal load, 1,020 lbs. Thickness $\frac{1}{32}$ in. The circular tube indicated in the diagram as being of the requisite strength for this load has an external diameter of 45 mm. ($1\frac{13}{16}$ in.). Streamline tube having same strength d = 45:1.5 = 30 mm. ($1\frac{13}{64}$ in.). As the ratio of s to d is less than 1/30, it will be advisable to adopt a thickness of $\frac{3}{64}$ in. In that case d = 41:1.5 = 27.5 mm. ($1\frac{3}{32}$ in.).

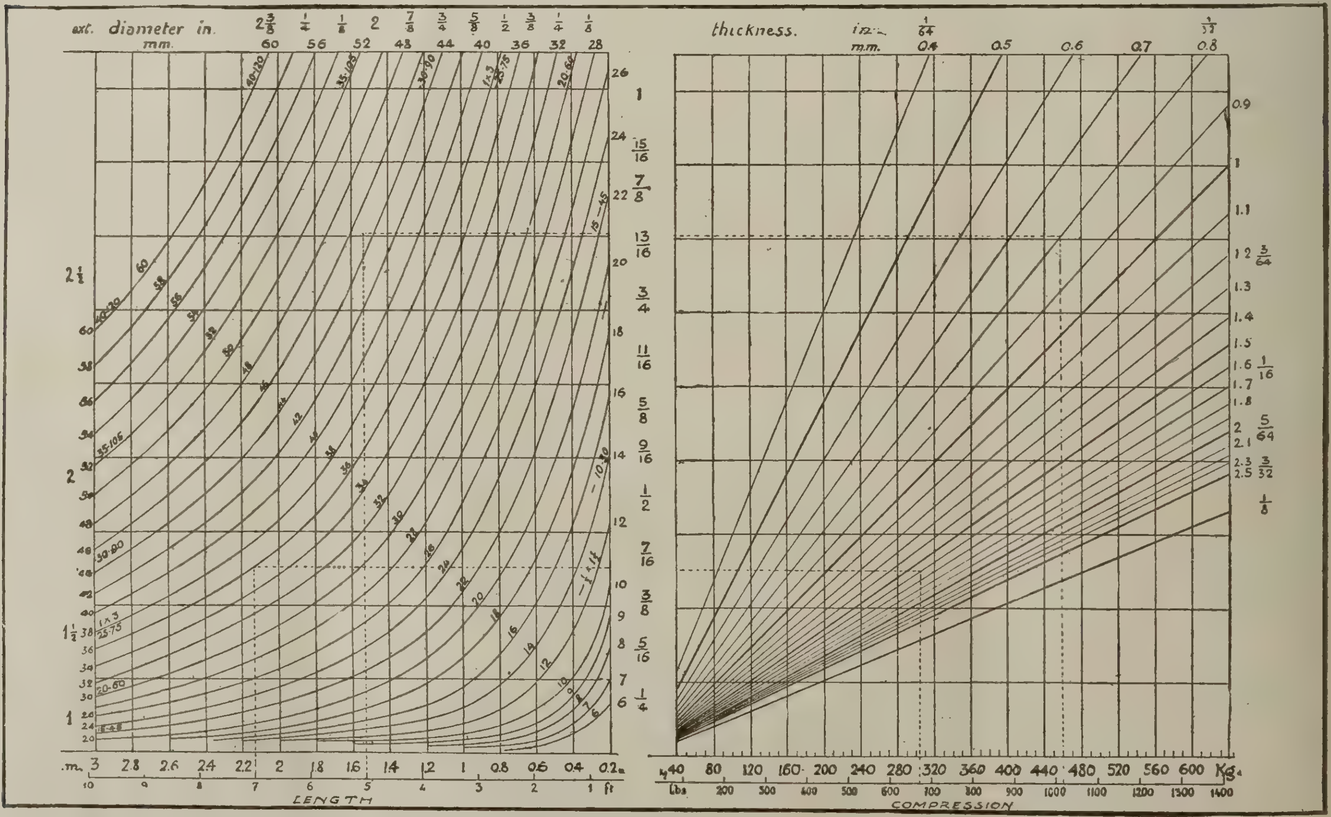


Fig. 2.—Graph showing strength of circular steel tube struts of various dimensions, the material being assumed to be steel of ultimate strength of 37 tons per sq. in. For the section shown in Fig. 1 the values found for circular struts must be divided by 1·5. Other streamline sections would, of course, have different values.

EVERY MILITARY AVIATOR OUGHT TO KNOW WHAT HIS OWN AND THE ENEMY'S MACHINE CAN DO AND HOW THEY LOOK

By HENRY WOODHOUSE

Author of the "Text-book on Naval Aeronautics",
"Text-book on Military Aeronautics", etc.

IN three previous issues the writer pointed out that the Allied Government found it necessary to teach their aviators and students all about their own machines, and as much as possible about the enemy's machines, particularly their appearance. As a basic principle, the aviator is taught that what does not look like one of the Allied machines must be an enemy machine. Therefore, every effort should be made to bring it down.

The anti-aircraft forces are taught the same thing, and that knowledge of the features of the different types of aeroplanes is one of the prime factors in making the anti-aircraft forces efficient.

Lacking that knowledge, both the Allied air forces as well as the anti-aircraft defenses, get confused and permit the enemy to get temporary advantages, which cost the lives of Allied aviators, as well as of the population of the cities which are raided—without mentioning the strategic advantages which the enemy gains through gathering information or surprising the Allies.

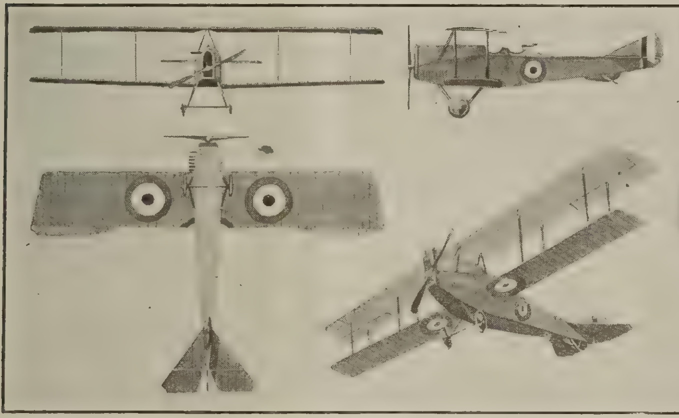
Besides teaching military aviators to know their own and the enemy's machines, what they can do and how they look, the Allied authorities also found it advisable to have continuous progressive changes in their types of aeroplanes.

It was found that German aviators had a certain amount of fear for a new type of aeroplane, because they did not know what it could do and past experience had taught them to beware of appearance. As a member of the Lafayette Escadrille put it: "The Boche was never so surprised as when he attacked a certain type of machine which looked like a two-seater, and got fired on by the third passenger, who was an extra gunner, well equipped with twin Lewises."

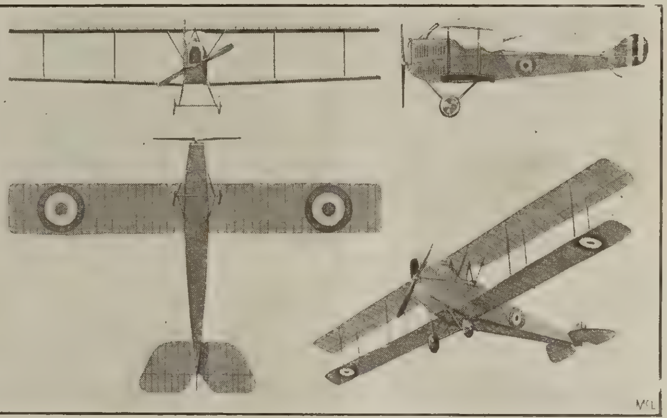
The policy of keeping the enemy "guessing" is good strategy—so long as it does not interfere seriously with production. It can be applied especially in the smaller types of machines used to maintain the supremacy in the air during the daytime on the fronts. It has little value in so far as the large bombing machines used for night bombing are concerned, because the night aeroplanes cannot be seen. It may be deducted from the types of German machines captured that the Germans are also following this policy. They keep up a continuous progressive change of types, adopting the good points of captured Allied machines, adding other points which are suggested by the progress of the science.

The Gothas followed the capture of the Handley-Page bomber, and now the dispatches advise that the Germans are building larger machines equipped with four motors.

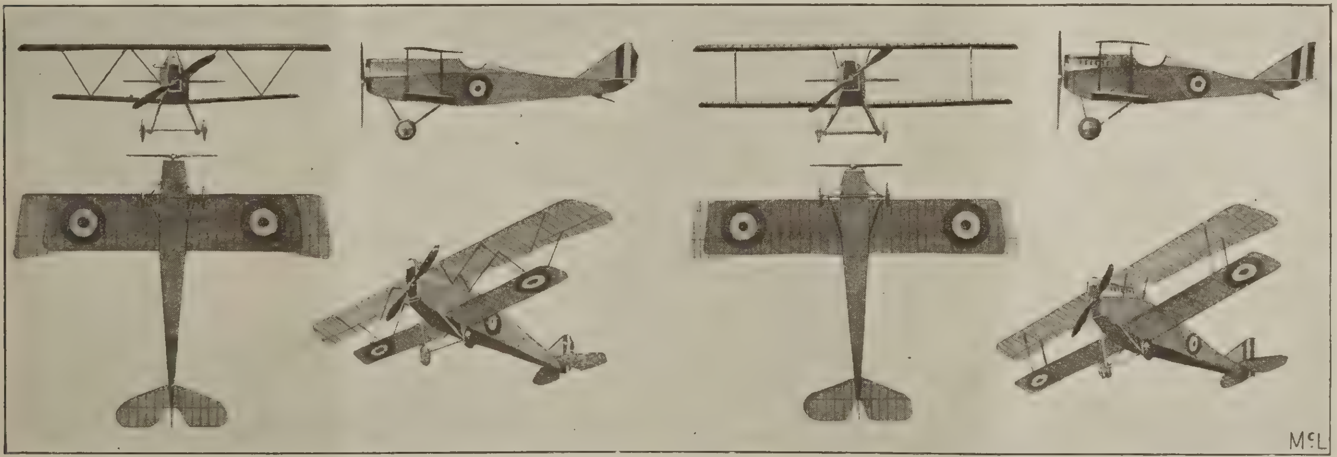
Some of the smaller machines look very much like the French and British machines and it would be hard to recognize one from the other, were it not for the iron cross on the planes. This similarity in characteristics has necessitated closer study of German types and how they look.



Pomilio (Italian). Two place Reconnaissance and Bombardment aeroplane equipped with a 6-cylinder 200 H.P. Fiat engine. Carries a movable Fiat machine gun upon a ring surrounding the rear cockpit, and a synchronized gun firing forward. Ailerons on the upper plane increase in chord as they leave the trailing edge of the main plane. Trailing edges of lifting and controlling surfaces are fluted. The upper part tail skid is enclosed in a sheet aluminum streamline covering which is easily discernable from the side. Upper plane flat in span, but lower sections have a slight dihedral. The Pomilio Co. also builds a fast Scout, which cannot at this time be described.



S. I. A. (Italian). A two-place Combat machine which has recently proven its remarkable power of endurance in a non-stop flight from Turin to London and a 1000-mile flight from Turin to Naples and return. It is equipped with a 6-cylinder Fiat engine, with an exhaust stack leading to the upper plane. Both planes have an equal span. Central braces from the fuselage to upper plane are in the form of the letter W. Trailing edges of plane surfaces are straight and not formed of wire, as in many other Italian aeroplanes. A balanced rudder is used.

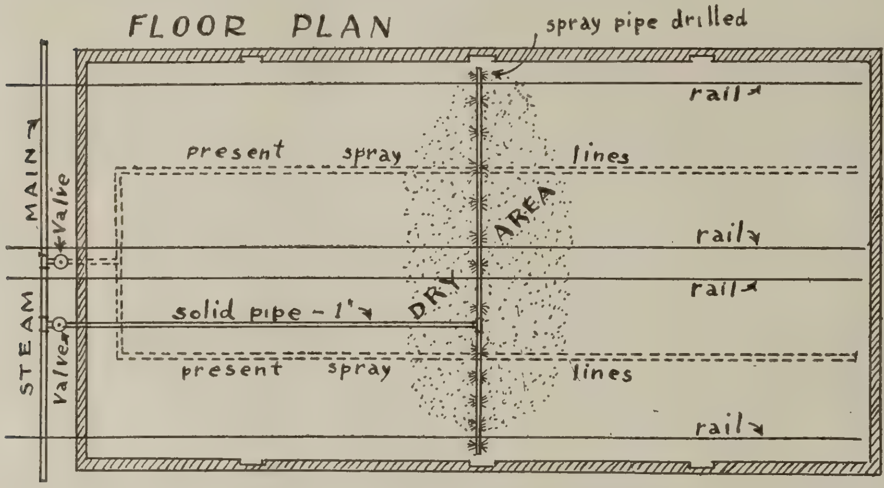


S. V. A. (Italian) Fighting Scout. Several types of scouts are turned out by Gio Ansaldo & Co., of Genoa. The two illustrated above are said to have been used extensively. Both machines are equipped with 210 H. P. "SPA" engines. In the machine at the left the tubular steel struts are inclined laterally, a structural feature which is an identifying characteristic. The body is very deep and proportionately narrow, especially toward the tail. The tail group is somewhat similar to the French Spad, although the tail plane of the S. V. A. is smaller. The machine at the right has a single set of vertical struts at either side of the body, and the struts from fuselage to upper plane slope outward at their top. In both machines, the lower plane has a slight dihedral. There is no stagger nor sweepback. The usual two wheel landing gear and a spring steel tail skid are employed. These machines carry a machine gun at the side of the fuselage, synchronized to fire through the propeller path.

DRY KILNS—A SAFETY FACTOR IN AEROPLANE CONSTRUCTION

By VICTOR R. JOSE, Jr.

"WOULD you want to be the cause of even one United States aviator crashing to earth in a pitiful wreck because the wood you built into his aeroplane snapped in midair?" I recently asked a manufacturer who wanted to know why he should change his methods of drying lumber.



"Well, if that is the situation, we certainly must change our kilns and system. Make your recommendations; results, not costs; in they go!"

With that spirit of patriotism manufacturers are facing the greatest change in the methods of drying of wood since the dry kiln supplanted the smoke kiln. The aeroplane has forced a tremendous awakening in the lumber industry which gives promise of big results and success after the war as well as those already apparent and for immediate use.

The old method was one of extracting the moisture from the wood; literally baking it out; drying the wood. Consequently there developed the commercial "Dry Kiln." The only idea at that time was to get the water out—turn on a supply of heat and pull the water out fast. No one ever weighed a board or thought of examining a sample piece. As a matter of fact, no one in charge of the kilns would have known how because the drying was entrusted to any yard man or laborer who could turn a steam valve. If the lumber had been in "long enough" it was time to pull it out. Whether it contained 12% of moisture or was bone dry only mattered in so far as that the bone dry usually milled easier. You see all this was even before Wrights had reached that preliminary stage of invention where the genius is accepted as a "nut."

There being an abundance of lumber in this land of limitless resources, only the best need be used. There was always a constant stream of fresh material coming in so that the mushroom piles in the yards, tilting this way and that, sprang up above the mill yard fences on all sides. The supply was always ahead of the demand and so the lumber stood in the air and seasoned for months before its turn came. Practically every bit that went into the dry kilns had been previously seasoned in the air-seasoning laboratory of that versatile specialist, "Mother Nature." Ask any number of the older kiln men whether this preliminary drying is necessary and they will chorus "yes." Ask any number of them why, and they will solo any number of reasons.

A meddler came along one day and compared the meager available data. He noted the different systems in use, and he asked about the different temperatures recommended for the drying operation. But success brooks no meddlers; figuring costs had not yet reached the dry kiln out on the edge of the plant. The meddler was soon suppressed.

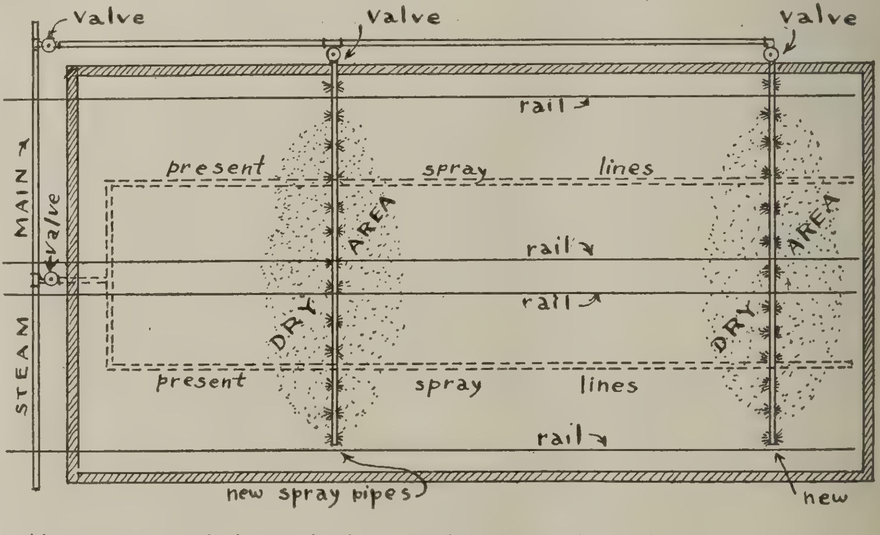
Along came an insistent domineering chap called "Mars." And in his wake came buyers from the nations abroad. They bought up all the available stock of lumber which had been seasoned by "Mother Nature," and the piles flattened even as they had grown. Spruce, birch. quarter-sawed oak, went as tho rubbed off of a slate. And when "Mars" demanded of Uncle Sam that he build aeroplanes—thousands of them—the kiln operators gasped.

Could virgin spruce and oak, green from the saw, be dried at all? How fast could it be done? How fast *should* it be done? And at what temperatures? These were only the major questions of an endless series that presented themselves.

Then someone added to the burden by "wondering" whether different temperatures and methods might not affect the cells and the strength of the lumber; for when you get down close and look through a miscrscope you are dazed by the omniscient foresight revealed in the wonderful construction of those minute cells, and walls, and passages.

The demand was for supreme strength, for the precious lives of the "Cavalry of the Air"—*our* Cavalry—depended on thin, frail, strips of wood of lightest possible weight and greatest strength upon which the burden rested in flight. And with this sobering demand, and the abnormal conditions with which to meet it, new instruments or at least new methods were imperative. Clear thinking immediately reached this conclusion.

Scores of experiments were made. They developed the conclusions that high temperatures weakened the strength of the wood. Its power to resist shocks was lowered; and the shocks in battle flight are many. Impact tests, vibration tests, bending and strength tests of various kinds, developed curves showing wide differences in specimens seasoned at different temperatures. It was found that spruce should not be started higher than 120 degrees F., and that this temperature should be built up to a maximum of 145 degrees, with the increase gradual according to the amount of moisture in the wood from time to time and *not* according to an arbitrary chart. The speed of drying becomes an individual problem in each case. Instead of an arbitrary number of days for drying determined upon loading the kiln, the drying is determined by the actual reduction of moisture in the lumber.



The moisture content of the lumber is definitely determined in small test discs taken from representative boards. Weighed when cut and again after being thoroughly dried in an electric oven, the loss of weight shows the loss of moisture. From

Officers of Aircraft Manufacturers' Association, together with officers of the Standard Aircraft Corporation. Top row, left to right: B. L. Williams, former secretary, Aircraft Manufacturers' Association; John P. Tarbox, Curtiss Engineering Corporation; Fay L. Faurote, Curtiss Aeroplane and Motor Corporation. Middle row: D. C. Meenan, treasurer, Standard Aircraft Corporation; A. B. Bliss, Burgess Company; A. C. Pope, manager, Wright-Martin Aircraft Corporation of Los Angeles; J. G. Ridenour, vice president, Wright-Martin Aircraft Corporation; C. H. Day, chief engineer, Standard Aircraft Corporation. F. G. Barnard, production manager, Burgess Company; F. W. Atkin, Dayton-Wright Aeroplane Corporation. Lower row: B. S. Foss, B. F. Sturtevant Company, secretary of Aircraft Manufacturers' Association; H. B. Mingle, president, Standard Aircraft Corporation, and treasurer of Aircraft Manufacturers' Association; Frank H. Russell, president, Aircraft Manufacturers' Association; R. I. Ware, Thomas-Morse Aircraft Corporation.

a great number of these, taken from each load, the average moisture content of each and any board in the kiln charge is computed.

Carefully weighed sample pieces, two feet long and of average condition, and three for each 5,000 board feet in the kiln, are placed at various points in the piles. Each one being weighed, the amount of its weight which represents moisture and not wood substance, is computed on the basis of the average obtained from the small discs. These two-foot samples dry under the same conditions as the rest of the charge. They are weighed each day to see how much moisture they are losing, and their condition governs the decisions to advance or retard the temperatures of the kiln.

Experiments also showed that the tendency of the lumber to dry on the surface must also be met and retarded to prevent such conditions as "case-hardening," a condition in which the outer portion drives under stress and sets up a strained condition of the fibers when dry. It was found that "case-hardening" was affected by the humidity of the air as it circulated against the surfaces of the lumber. As in the case of temperatures, so here again a schedule was evolved on the basis of moisture content, running from 80 per cent at the start to 33 per cent at the end. (For oak the range is temperature 105 to 135 and humidity 85 to 40.) Repeated examinations of the air in the kiln are made at frequent intervals by means of instruments known as "Hygrometers," "Hygrodeiks," etc., from which the relative humidity is determined.

Recording thermometers are provided for each 36 feet of length of kiln and on charts in the operating room the patient pen automatically marks the exact condition for every minute of the day and night.

Watching the records as they go down on his chart from hour to hour—weighing samples, reading Hygrometers and "mixing brains with his hands"—the operator controls the evaporation and conditions so that the movement of the water from within the tiny cells and the cell walls is produced and accelerated in such a way as to cause no injury to the structure and no loss of precious strength.

Even in piling the lumber the old haphazard slapstick method has given way to careful stacking with a view to expediting circulation and controlling its course.

The strength of every board is being jealously guarded through the entire process. When the lumber, "on its way to the clouds," leaves the kiln seasoning department it is fit for the world's finest fighters. A tremendous increase in efficiency and safety has been added by modern seasoning.

Government inspectors over every kiln assure the rightly anxious flyer that only the fit will be sent out for his use.

Suggestions for Dry Kiln Operators

Humidity plays such an important part in the drying of lumber for aeroplane uses that it needs the very closest attention. Too much humidity causes no sleepless nights, but the demons of "case-hardening" and "hollowhorning" walk the bed rail at the suggestion of a drop in the relative humidity of your kiln.

In long kilns this problem often becomes quite serious upon close examination of the kiln. Investigation of different sections of the kiln, as, for example, near flues in external ventilating kilns, will often disclose "pockets" or "spotted" areas.

"Pockets" often exist, although the regular points for taking Hygrometer readings show proper humidity readings. For example. in the areas near a ventilating flue, the air, which has passed through the lumber and picked up moisture, is being pulled out so fast that there remains only the dry, hot air coming up through the heating coils. The relative humidity of dry, hot air is, of course, very low. Consequently in that immediate neighborhood a pocket of low humidity exists. Often this affects a whole truck of lumber at that point. This same condition may also affect several points.

The whole kiln can be reached by means of the steam spray lines which usually run the entire length of the kiln. But the fact that they do run the entire length makes them impractical for temporary uses on small local areas.

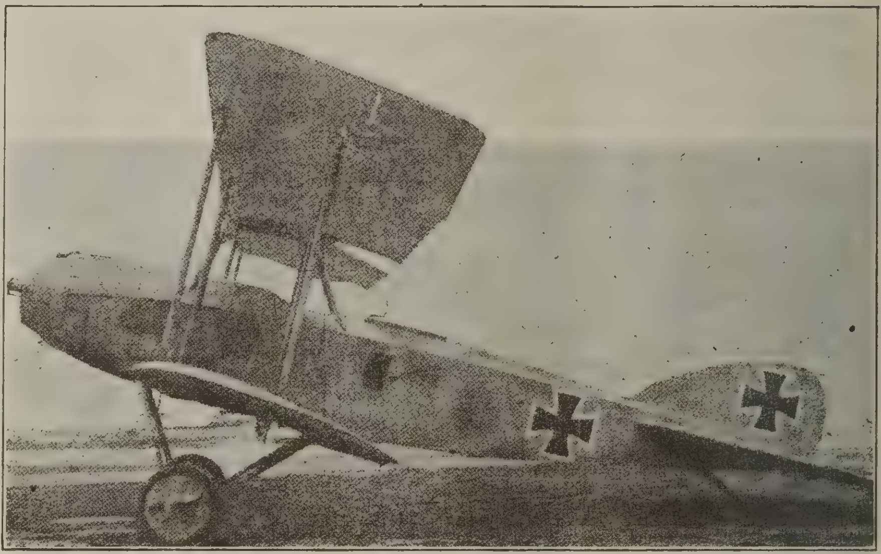
A simple remedy is applied by tapping in on the main steam line with a small spray line; usually a one-inch line is sufficient. Control this line by means of a small hand valve. Run it to the point where the "pocket" occurs, and then across the "pocket area." Along its entire length across the "pocket area" drill 3/16" spray holes on the bottom on about 8" centers. Whenever the pocket occurs turn the control valve for this individual line and let in enough spray to properly humidify the air. If necessary this spray can be left just barely "sizzling" continuously. Control over one area is thus provided without turning steam into the entire kiln, an operation which destroys the working balance of temperature, general humidity and often of circulation.

THE ALBATROS TYPE "CV" FIGHTER

(Continued from page 212)

IN the preceding article on the Albatros Fighter, published by courtesy of "Flight," scale drawings and detail sketches (figures 1 to 7) were shown. This week we deal principally with the fuselage and tail plane.

Fig. 8 shows, in side elevation and plan, the general arrangement of the fuselage, and should, in conjunction with the various sections and key diagrams, explain fairly clearly the general layout of the body. It will be noticed that in plan the sides of the body are straight from the tail post forward to the pilot's cockpit. For ease in manufacture it is an advantage that the ribs of the tail plane should be at right angles to the spars, and in order to effect this it is necessary that the sides of the body should be parallel for the length of the tail plane. Since, however, to provide for this the longerous would have to be changed from a converging direction to a parallel one which would necessitate a somewhat sharp bend in them at the point where the tail plane commences, and as, moreover, the depth of the tail plane is not the same as that of the body except at the extreme rear, a different



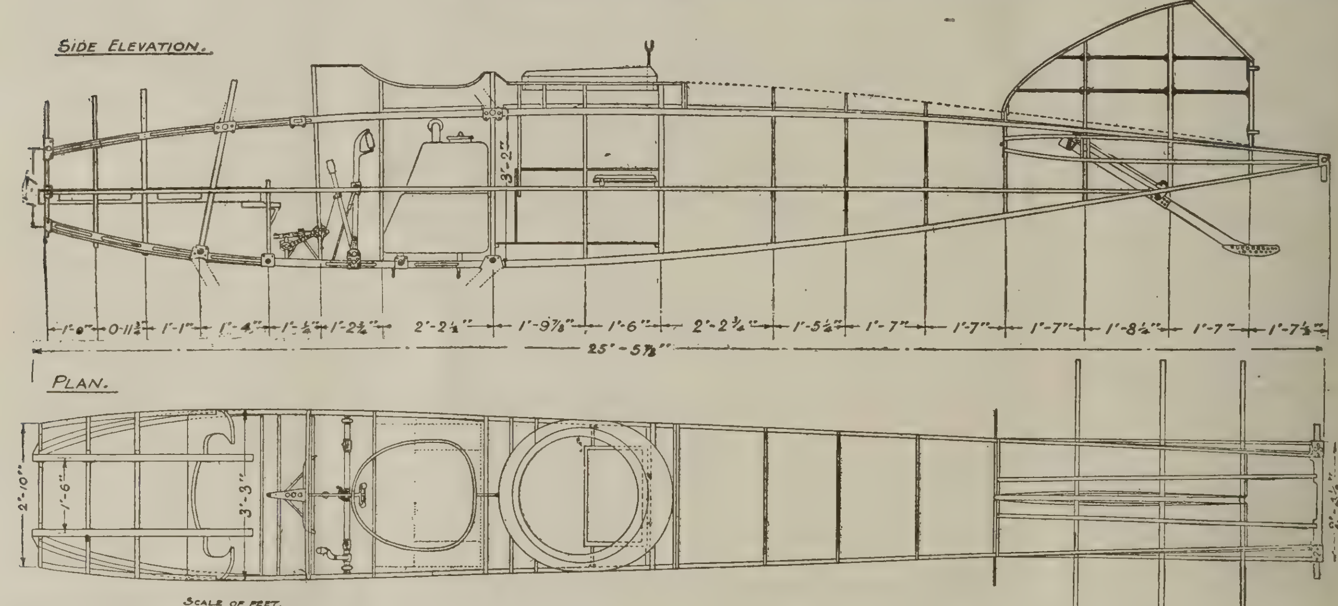


Fig. 8.—General arrangement of the Albatros body. Side elevation and plan to scale.

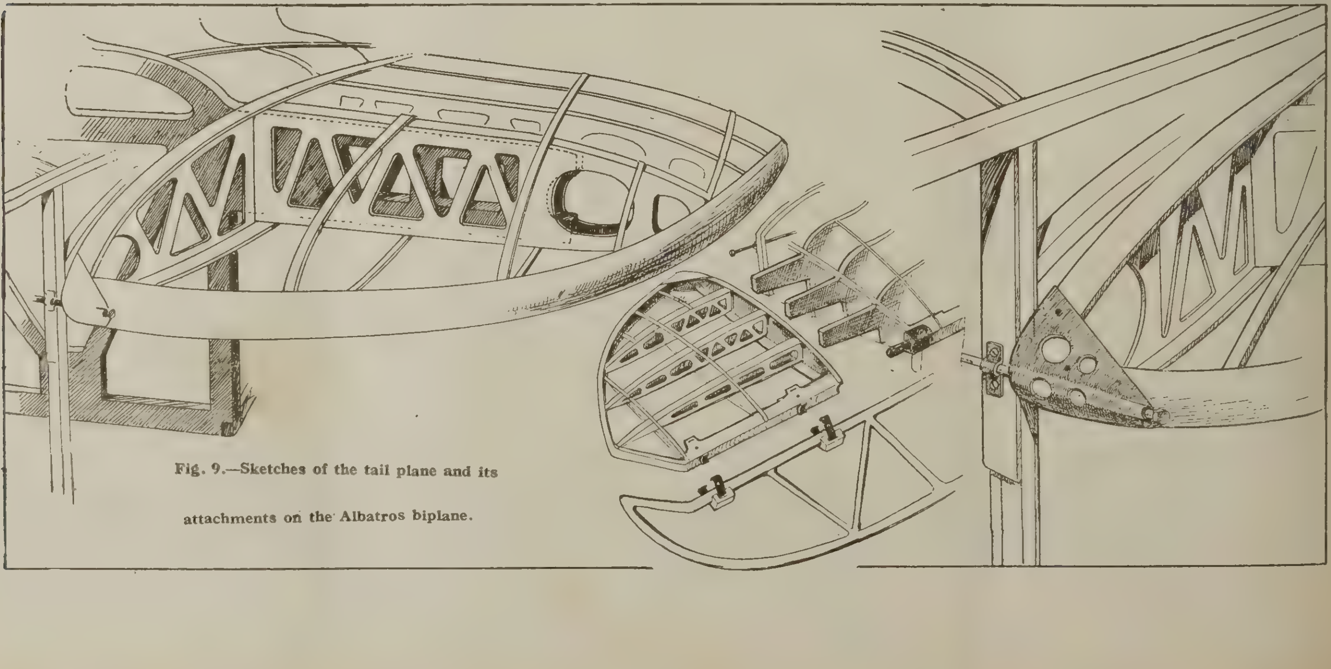


Fig. 9.—Sketches of the tail plane and its attachments on the Albatros biplane.

course has been followed. From the point where the tail begins two extra longerons on each side have been built into the bulkheads of the body. These two short longerons have, in plan, a direction parallel to the line of flight, while the main longerons continue on their converging course. This arrangement is indicated in the plan view Fig. 8. In side elevation the short longerons, against which lie the inner ribs of the tail plane, have the same curvature as the tail plane. In this manner the lines of the rear part of the body are not spoiled, while an easy flowing curve is provided for running the tail plane into the body. The arrangement will be further made clear by reference to Fig. 1, page 224.

Reference has already been made to the peculiar attachment of the tail planes to the body. The sketch at the top of Fig. 9 shows in perspective this attachment, which is also illustrated in the diagram in the bottom left-hand corner of Fig. 9. The bulkheads of the body are extended outwards to form cantilever beams which support the tail plane. There are three of these cantilever beams, while further support is provided for the tail plane leading and trailing edges as indicated in the sketches. The spars of the tail plane are of the box type, built up of ash flanges with thin three-ply sides, cut out for lightness. These spars are so proportioned that they fit over the cantilever beams, which do not, it will be seen, run right out to the edge of the tail plane, but are finished off just outside the second tail plane rib. No external bracing of the tail plane is provided, the depth of it and the method of mounting being relied on for the necessary strength.

To provide against the tail plane sliding off its cantilever supports it is secured at the leading and trailing edge. The former attachment is indicated in the bottom right-hand corner of Fig. 9. A sheet steel shoe fits over the corner of the leading edge and inner rib, and through this shoe a long bolt passes, which runs across the body to a similar shoe on the other side. In Fig. 10 is shown the rear attachment of the tail plane. A sheet steel box surrounds the corner of the fuselage. Welded to this box is a short tube which fits into a circular recess in the end of the trailing edge of the tail plane. As the elevator tube runs right across and is fitted with collars bearing against the sides of the clips that form the bearing for the elevator tube, the trailing edge of the tail plane is prevented from slipping outwards.

The manner employed of forming bearings for the elevator is indicated in the diagrams of Fig. 10. A steel strip is bent over the tube, and its two free ends are bent over and fit into slots in the trailing edge of the tail plane. Each clip is then secured to the tail plane by a vertical bolt as shown in the diagram. The trailing edge of the tail plane is spindled out to a semi-circular section as shown, and a curved metal distance piece is screwed to this trailing edge or spar, so as to form the second half of the bearing of which the bent steel strip forms the other half. To remove the elevator the bolts securing the clips are undone; the clips are then bent outwards until their free ends clear the slots, when the elevator can be removed bodily.

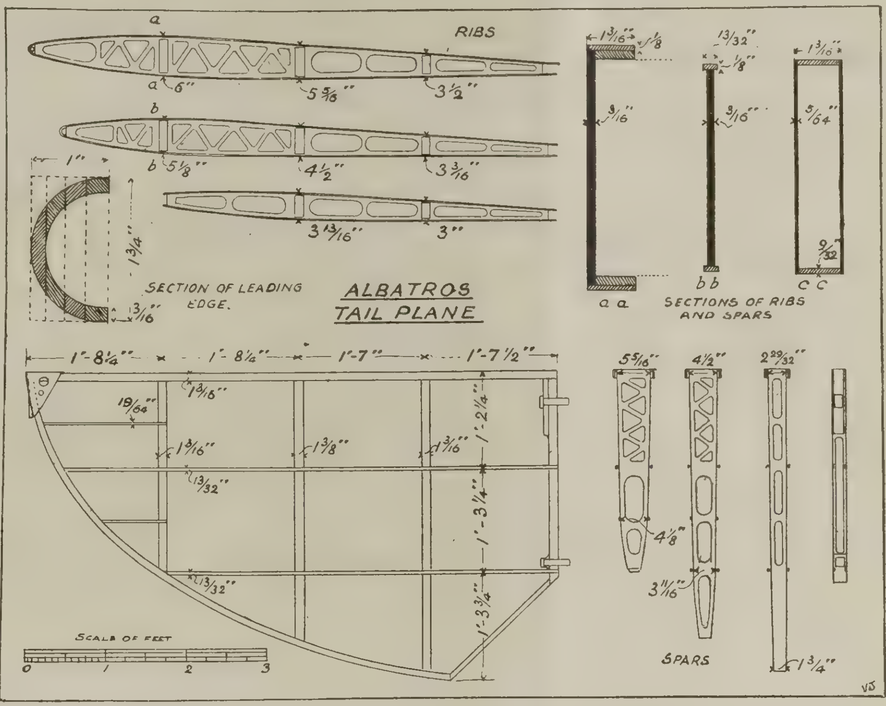


Fig. 11.—General arrangement and dimensions of the members of the tail plane on the Albatros biplane.

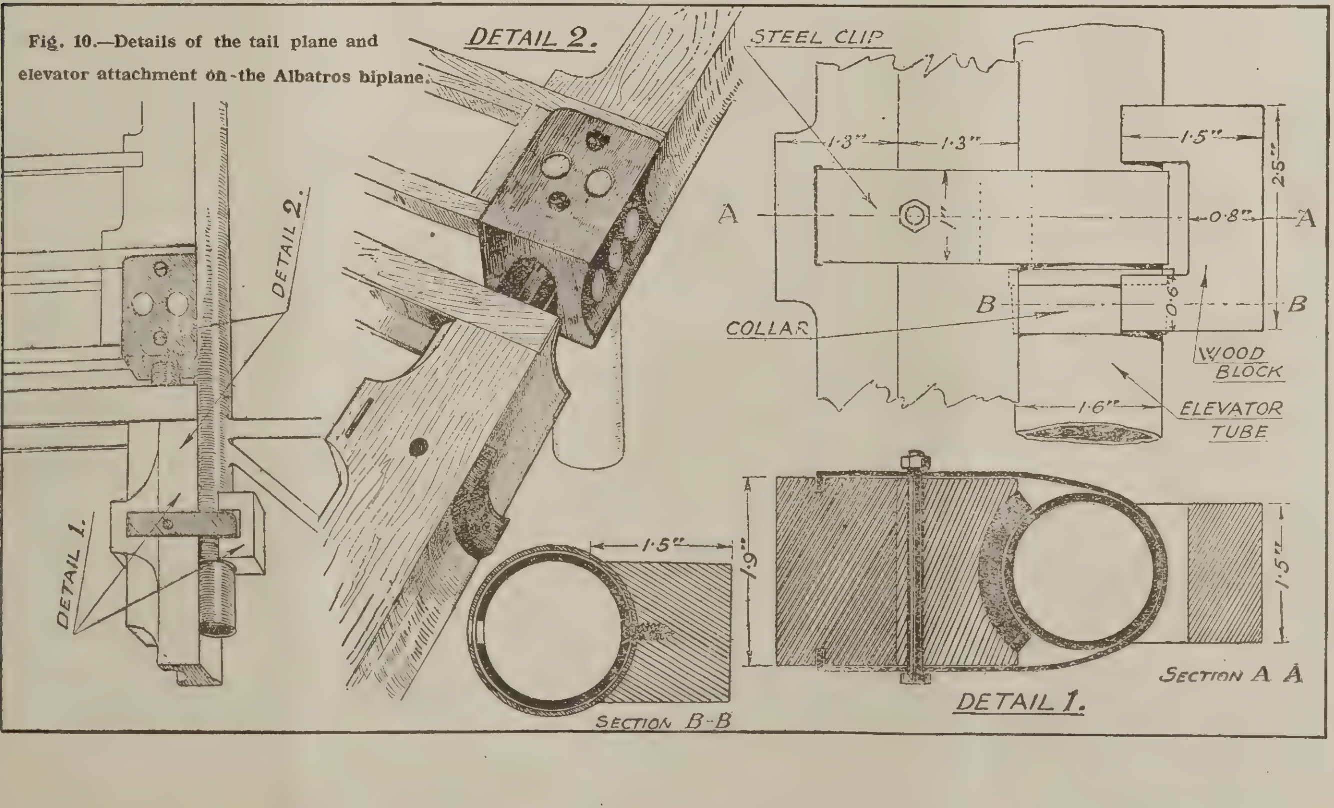
As the elevator is built of steel tubing throughout, wood blocks of the shape shown in detail 1, Fig. 10, are employed for attaching the fabric covering. These blocks span over the steel strip bearings, and are secured to the tubular leading edge of the elevator by screws as shown in section B-B. A hole in the opposite wall of the tube serves for the insertion of the screwdriver.

Under the horizontal stern post of the body are two short tube stumps, closed at their lower ends. The object of these is not at first apparent, since they appear too short to protect the elevator, but when it is remembered that the Germans favor transportation by road, trailing the aeroplane behind a lorry, it becomes at once evident that these stumps serve to support the stern of the body on the floor of a lorry while the machine is trailed behind on its own wheels.

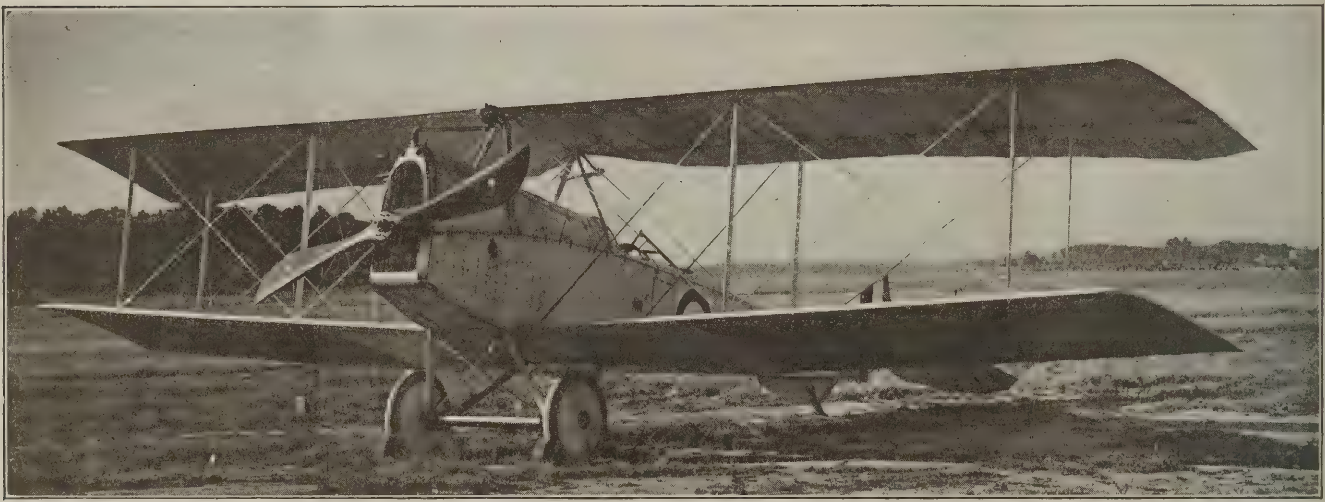
As regards the remaining details of the tail of the Albatros little need be said, as they are fairly evident from the plan and sections of Fig. 11. It will suffice to point out a rather ingenious construction of the leading edge of the tail plane. In plan the tail plane, it will be seen, is roughly semi-circular, and its leading edge therefore has to be shaped to this curvature. As an ordinary strip of solid spruce spindled out to a semi-circular section would scarcely be strong enough for this work, a different method has been employed. It appears that originally the leading edge of the tail is made up of four laminations of ash, having, of course, their grains running in slightly different directions. The rectangular section spar thus formed is then spindled out to a semi-circular section, as shown in the diagram, leaving the impression that the leading edge is made up of seven thin strips of wood glued togeaher. The resulting leading edge appears to be one of great strength, while at the same time being quite light.

(To be continued.)

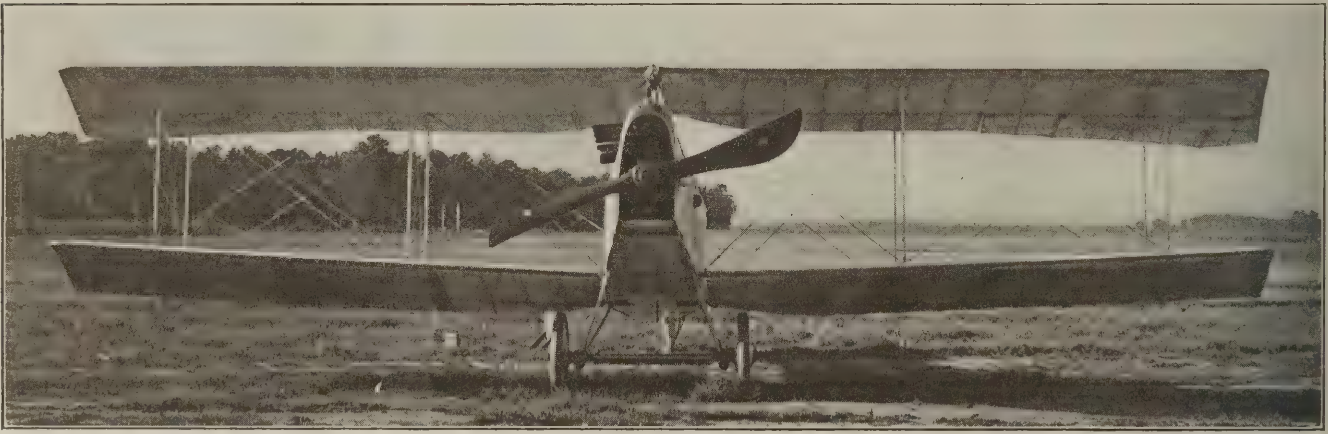
Fig. 10.—Details of the tail plane and elevator attachment on the Albatros biplane.



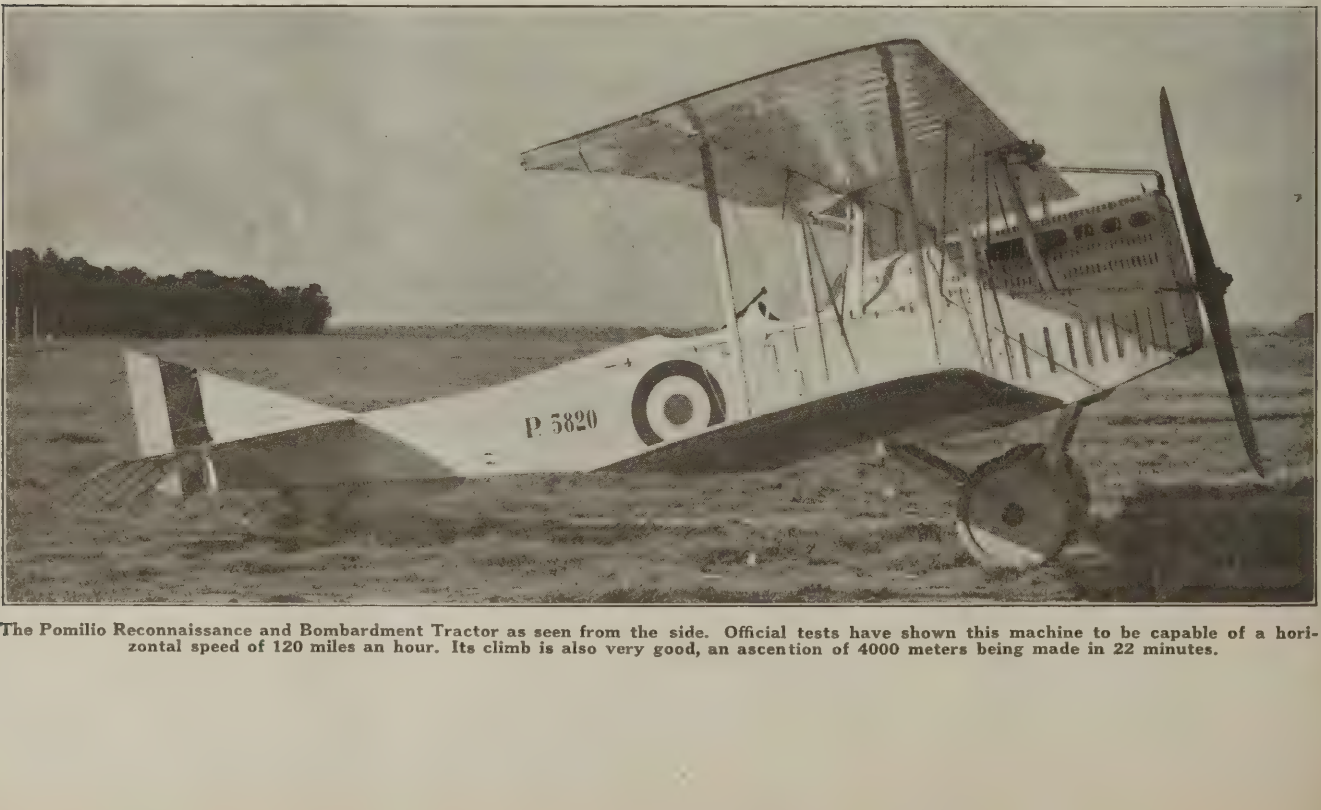
THE POMILIO RECONNAISSANCE TYPE TRACTOR



The latest Pomilio Reconnaissance and Bombardment Aeroplane, one of Italy's powerful weapons of defense against the Austro-Germans. Apparatus is carried for the release of bombs, and a movable machine gun is mounted at the rear cockpit.



Front view of the Pomilio Aeroplane. It has a 6-cylinder 200 H.P. Fiat engine and a Fiat machine gun. Wing span, 38'-0"; height, 10'-0"; overall length, 30'-0".



The Pomilio Reconnaissance and Bombardment Tractor as seen from the side. Official tests have shown this machine to be capable of a horizontal speed of 120 miles an hour. Its climb is also very good, an ascention of 4000 meters being made in 22 minutes.

THE SENATE INVESTIGATION OF THE WAR DEPARTMENT—AIRCRAFT PRODUCTION

Majority Report Urges One Man Control of Air Program

THE Committee on Military Affairs of the Senate, on April 10, submitted the following report on the aircraft situation:

"The Committee on Military Affairs, being engaged under authority of the Senate in an investigation of the War Department, and having taken much testimony, herewith submits the following report in the matter of aircraft production, together with certain recommendations:

Training Schools

"The Signal Corps has established and is now conducting 20 aviation training schools in the United States. Four additional schools are in process of construction and are expected to be finished in June next.

"The aggregate capacity of the schools now in operation is something over 3,000 cadets. One thousand nine hundred and twenty-six have thus far been graduated from this primary training course and commissioned as reserve military aviators. Very few of these have received their advanced training in this country.

"In addition to the above, the Signal Corps, acting upon the invitation of the several entente Governments, dispatched some 1,200 cadets to England, France, and Italy last year, who were to receive primary and advanced training in aviation schools of those countries. The experience of a great many of these men has been most unfortunate in that at some of the schools a very serious delay has occurred in providing them with the training planes, which it was expected would be manufactured in foreign factories in sufficient number. As a result, several hundred of the American cadets have been practically idle and have made no progress. About 450 of them are reported as having completed the primary training after long delay. The Signal Corps is giving serious consideration to the advisability of bringing the remainder back to the United States to be trained. With the exception of this severe disappointment, the primary training of our aviators, according to the testimony of the aviation officials, appears to be progressing favorably. The health record of the schools is excellent and the fatalities arising from aviation accidents, while always distressing, appear to be less frequent than in the schools of our allies, according to the testimony of the Chief Signal Officer.

Training Planes

"For some time after the inception of the work the output of primary training planes in this country for use in our schools gave ground for grave concern. In recent weeks, however, the output has been greatly increased and there seems to be no doubt of the Signal Corps having an amply sufficient number in the future. On April 1, 1918, 3,458 primary training planes had been completed. The planes are of two standard types developed for the purpose and are equipped with Curtiss and Hall-Scott motors, respectively. The advanced training planes are being turned out in accordance with the schedule and estimates laid down at the inception of their manufacture. In advanced training planes four types are being made, the total number up to date manufactured being 342. In these planes three types of engines will be used, of which 965 have been completed. These include Gnome, Le Rhone, and Hispano Suiza, all of foreign design but American manufacture. The Liberty motor is not suitable for use in these planes.

The Liberty Motor

"It is apparent from the evidence that the 12-cylinder Liberty motor is just emerging from the development or experimental stage. Since the original design and the setting up of the first completed motor in July, 1917, a large number of changes have been found necessary, many of them causing delay in reaching quantity production. Within the last two months changes of considerable importance have been made which, it is hoped, will make the motor serviceable for combat planes of the defensive type, and for bombing and observation planes. It is not designed for and can not be used in the swift, single-seater fighting machine. A few of the motors are being flown in appropriate machines. These reports, as recited to the committee, indicate that with the latest changes the motor will be satisfactory for the character of work expected of it and that it bids fair to hold its own with foreign motors of similar power, weight, and purpose. For the campaign of 1919, the Liberty motor must undoubtedly be further improved in order to keep up with the evolution constantly going on along the front. The motor as now manufactured is of the direct-driven type, a type which has limits of usefulness in heavy machines.

"Steps are being taken in the designing of a geared drive, in order that the usefulness of the motor may be further extended and further improvements attained. Twenty-two thousand five hundred Liberty motors have been ordered, 122 have been completed for the Army, and 142 for the Navy. Four have been shipped overseas. Some of those already delivered are being altered to overcome the defects ascertained during the last few weeks. It is understood, however, that these alterations will consume but a very short time. The production of Liberty motors to date is, of course, gravely disappointing. The testimony shows that experts of the highest reputation and experience have, since last July, repeatedly warned the officials of our Government that the perfecting of a newly designed motor must inevitably involve many months of painstaking experiment accompanied by many setbacks and disappointments. In spite of the unanimous testimony of motor experts along this line, the Government officials having the manufacture of the Liberty motor in charge have made the mistake of leading the public and the allied nations to the belief that many thousands of these motors would be completed in the spring of 1918. Information of this sort, not borne out by the facts, has been injurious, and its constant dissemination the committee regards as misleading and detrimental to our cause.

Combat Planes

"The production of combat planes in the United States for use in actual warfare has thus far been a substantial failure and constitutes a most serious disappointment in our war preparations. We had no design of our own; neither did we adopt any one of the European designs until months after we entered the war. Much time was consumed in discussion as to types. Innumerable changes in designs and specifications of the types finally decided upon have cost further delay. In all, five types have, at one time or another, been adopted. Two of them have been abandoned after the expenditure of much time and money. The three remaining types still left upon our program are now in the course of manufacture. Of these, the largest and most powerful is the Handley Page heavy bombing machine, designed to carry as many as six men, eight machine guns, and a heavy load of bombs, and to be driven by two Liberty motors. The history of the negotiations for the adoption and manufacture of this plane afford a remarkable illustration of procrastination and indecision, too long to recite. Suffice it to say that the designs and specifications of this plane which had been used with marked success by the British and placed in production by that Government, were offered to our officials as early as May, 1917. The testimony before your committee shows that the Signal Corps finally decided upon the manufacture of a number of sets of parts of this machine about January 1, 1918. Eventually the finished and tested parts will be shipped to England, where they are to be finally assembled in factories now being prepared for this work. Officials of the Aviation Section of the Signal Corps testify that they do not expect the completion of the first set of parts in this country before the month of June, 1918.

"Another type of combat plane, known as the De Haviland, is included in our program. This machine habitually carries two men, four machine guns, a moderate load of bombs, and other apparatus and is to be driven by one Liberty motor. Fifteen have been completed; 1 has been shipped to France; the remaining 14 have been very recently completed in this country. Some of these have been tested, propelled by a Liberty engine, and appear to have given satisfaction. The third type upon the program is known as the Bristol fighter. This machine is lighter and faster than the De Haviland. Its speed is expected to be in the neighborhood of 125 miles per hour. It is what is known as a reconnoissance machine. Another term which might be properly applied to it is "defensive fighter." It carries two men, four machine guns, and is driven by one Liberty motor. The decision to make this type was reached on November 7, 1917. The manufacturers completed the first of these machines during the week ending March 30, 1918. The machine was tested once during that week with a Liberty motor, and, according to the testimony of the aviation officials, met its preliminary test successfully. This machine, a few hours after its flight, caught fire while standing upon the aviation ground and was entirely destroyed. The officials of the Signal Corps assured the committee that another machine would soon be finished by the manufacturer and that if it met the tests satisfactorily quantity production might be expected within a reasonable period. The testimony as to this machine was given on April 2, 1918. This completes the list of machines now under manufacture and constitutes a correct statement of the situation in this country as of April 1, 1918. In addition to the American production of engines and aeroplanes as herein set forth, considerable orders for combat aeroplanes and engines were last summer placed with European manufacturers by Gen. Pershing, and we have furnished quantities of material and numbers of mechanics to aid in their construction.

"Your committee has full information as to the number and quantity of machines and engines ordered here and abroad but does not feel justified in stating the number in this public report. The facts contained in this report are drawn from the testimony of the Chief Signal Officer, Gen. Squier, Col. Deeds, and Mr. Potter, the chief of the Equipment Division of the Aviation Section of the Signal Corps, and are confirmed from other sources official and otherwise.

"Your committee, being devoid of technical knowledge of motors and aeroplanes, does not undertake to point out in detail engineering and manufacturing errors which may have been committed and which, in part, may account for this gravely disappointing situation. Your committee, however, is convinced that much of the delay in producing completed combat aeroplanes is due to ignorance of the art and to failure to organize the effort in such a way as to centralize authority and bring about quick decision. A certain aloofness in dealing with persons possessing information based upon experience, an apparent intention of confining the actual production to a restricted number of concerns, and a failure of the officials in charge of the work to grasp the situation in a broader way and seize upon the best approved foreign engines and planes and proceed promptly to build as many as possible for the campaign of 1918 has contributed to the failure. It is greatly to be regretted that the statements of Government officials have misrepresented the progress of the aviation program. This has misled the public, and your committee, cognizant of the facts, has, in the performance of its duty, made this report to the Senate.

"Your committee believes that production of aircraft should be controlled by one executive officer, appointed by the President and responsible to him. He should be assisted by a corps of the best aircraft engineers and designers possible to obtain, both European and American. The matter of production should be taken out of the hands of the Signal Corps entirely, and no man who has any near or remote interest in a company manufacturing airplanes or engines should be permitted to act as adviser or be in authority. While we are developing American aircraft and American engines we should temporarily, at least, procure an abundant supply of approved types of aircraft and engines of European design.

"Further, it seems to the committee that every encouragement should be given to the development of aircraft and that any action which retards progress, such as trust agreements or the prevention of those developing machines from flying, under proper restrictions should be removed.

"The committee also believes it to be its duty to point out that thus far no broad plan looking to future development has been laid down by the authorities. Warfare in the air is still in its infancy and it is inevitable that rapid changes will take place in both engines and planes. It is essential to our success that those in charge of the American aviation development shall be constantly looking ahead and devising plans for a continued expansion of the program, as well as the development of new types of engines and planes."

THE MINORITY REPORT

The minority report follows:

"We do not believe that the report of the majority of the Senate Military Affairs Committee on the aviation situation shows a proper estimate of what is being accomplished or that it is sufficiently complete to give an accurate impression of the facts.

"Soon after the war began the Signal Corps arranged with the French Government for the making of 6,100 combat planes at a total cost of $127,000,000, the planes to be produced as rapidly as American fliers could be trained to operate them. As the American aero squadrons reach the front ready for duty, battle planes are being supplied them under this arrangement. To aid in this foreign manufacture of planes for American fliers, the Signal Corps has shipped to France 11,000 tons of various materials and has sent 7,000 mechanics to release for French factories making planes for our American fliers the French workers on motor transports. The Signal Corps then arranged for the making of about 11,500 combat planes in the United States, the term combat plane being here used to embrace all kinds of planes, both offensive and defensive, except training planes. The Curtiss Aeroplane Corporation, the Dayton Wright Aeroplane Company, the Fisher Body Company, the Standard Aero Corporation, the Grand Rapids Aeroplane Company, W. H. Mullen & Co., and about nineteen other companies throughout the country were engaged for the production either of completed machines or of spare parts.

"Let it be said here that when the war began the United

States Government had purchased altogether less than 200 aeroplanes in its entire history, and that of the few aeroplanes factories in this country probably not one was making over five or six a month. It is hardly possible to grasp the magnitude of the task the factories contracting to make the 71,500 combat planes found before them. New plants had to be constructed, old ones fundamentally changed. Special tools for the making of the planes had to be devised and manufactured, and mechanics had to be trained to make the tools and also to make the planes after the tools had been completed. An aeroplane, especially the battle aeroplane, is one of the most highly technical, delicate, and complicated machines known to man. In no other form of machinery is absolute and painstaking accuracy in the smallest details more indispensable. It has about 4,000 parts, and requires from 1,800 to 2,800 different drawings in the preparation for its manufacture—almost as many drawings as are required for a battleship. Every part is strained to the utmost while the machine is in the air, and the slightest break almost anywhere means instant disaster.

Perfection Necessary to Safety

"When it is remembered how often the wheels of railway trains, due to hot boxes, etc., parts of railway and automobile engines, tires on automobiles, etc., go wrong, necessitating immediate repair, and that any similar breakdown in an aeroplane would mean, as a rule, death to its occupants, some part of the responsibility and difficulty involved in making a finished plane may be understood.

"Remember further that every fighting plane must have machine guns, synchronizing devices, special telescope aeroplane sights, wireless apparatus, cameras of special type, electric heating devices for clothing, oxygen apparatus, speed indicators, special gauges, barometers, compasses, altometers, etc. To say that this complicated equipment is in steady and adequate production, and that the factories are now about in shape for quantity production of combat planes, and have about completed the foundation for what is as difficult and responsible a task as has ever fallen to the hand and brain of man, is to state the truth and at the same time to recite an achievement unparalleled in all history for so short a time.

"Remember again that when these combat planes were contracted for the only known lubricating oil adapted to their delicate parts was an oil made from the castor bean. There were not enough beans in this country to make anywhere near the amount of oil required. Neither were there enough seeds with which to grow the needed quantity of beans. The Signal Corps had to search the globe for seeds, and finally secured a shipload from distant India. Then the corps had to contract for the planting of the seeds in this country, and has succeeded in having about 110,000 acres planted. It is now claimed that a form of petroleum has been developed that will answer the same purpose. This, however, is still in the experimental stage, while the oil from the castor bean is known to be entirely adequate and reliable.

"Remember again that the cloth used in the wings of the aeroplanes of all types had to be treated with acetone, a liquid substance which makes the cloth as fireproof as possible, and also strengthens it for the immense strain to which it is subjected in the air. The Signal Corps is having this acetone distilled from wood under its own supervision on an enormous scale, and at a cost of about $20,000,000.

"The corps has had to find a substitute for Irish linen, as the material for wing cloths on training planes, and has succeeded in adapting a certain form of long staple cotton to this need.

"Coming to the training plane, it may well be said that the completion of 3,500 to date and the fact that they are now on quantity production, practically according to program, constitute a remarkable achievement when the nature of the task is fairly weighed. The training plane is simpler than the battle plane, and for that reason could be produced sooner, but the making of the training planes on a quantity scale is in itself a task of unprecedented difficulty and magnitude.

"Let it be remembered further that the Signal Corps had to put regiments of workers in the forests to find the spruce needed in the making of aeroplanes. The spruce trees are found among fir and other trees, and of each 100 feet cut only about 15 per cent is found good enough for aeroplane construction. Approximately 1,000,000,000 feet of lumber had to be cut and inspected and tested before the necessary 100,000,000 feet of spruce could be obtained.

"Propellers are made from mahogany and other highly durable woods, and three or four must be made for each machine. This mahogany comes from the tropics, and whether and when it can be brought to seaport depends on tropical rains, which swell the rivers so as to permit transportation.

Defends Liberty Motor

"Let us now consider the Liberty motor. The Liberty motor could not fairly have been called an experimental and untried device. It represented a combination of what had been demonstrated to be best in all motor construction. The Signal Corps, with its trained and skilled engineers, understood that a foreign motor could not be adapted to American manufacture and turned out in sufficient quantity in anywhere near the time in which the Liberty motor could be produced. Foreign motors are based on the metric system of measurements, etc. American practice and American manufacture are not adapted to this system. All parts made under the metric system must be converted into inches and fractions of inches under our system. The foreign motor is so extensively the result of hand work that it is with great difficulty adapted to the machine work that dominates American factories.

"Furthermore, the Liberty motor is capable of one hundred more horsepower than any foreign motor except a few of one single type, the Rolls-Royce. The Liberty motor develops 400-horsepower ordinarily and is capable of 465. The foreign limit, with the one exception above mentioned, is 300.

"The Liberty motor has become so well established that the British Government has asked for a large number. Sir William Weir, head of British aircraft production, stated recently in London that he considered the Liberty engine the greatest single factor in the world's aviation program; that it was the most important single thing in the air program of England in 1918.

"As soon as the Liberty motor had been designed, arrangements were made for the manufacture of a very large number before the close of 1918. The exact figures are withheld for military reasons. Henry Ford agreed to produce a substantial number of the total, the Packard another portion, the Lincoln Motor Company, Nordyke & Marmon, General Motors, and the Trego Company still another portion. These companies were notified to get ready last summer and the actual contracts were signed later. They have spent the intervening time preparing plants, tools, and workmen for this unprecedented work and are now on the eve of quantity production. The very names of those manufacturers are sufficient assurance that they would not take a day longer than necessary to lay proper and efficient foundations.

"The foreign planes which were accepted by the Signal Corps, known as light battle planes or single seaters, for which the Liberty motor is too heavy in horsepower, were none of those offered by foreign concerns that came to America soon after the war began to sell their wares, except the Handley-Page, and that was not the plane which the Handley-Page people first offered our Government on this side. Indeed, when the Handley-Page plane was first offered here it was untried and undeveloped, and had not been accepted by the British Government. The Signal Corps sent a commission abroad to study foreign planes on the ground, and accepted certain ones only after careful and personal study.

"On the whole the record of the Signal Corps is one of which every American can be justly proud. In the face of unparalleled difficulty it is accomplishing an unparalleled task with characteristic American energy, capacity, patriotism and enthusiasm."

The Vote in the Senate Committee

The majority report was signed by Senators Chamberlain, Chairman of the committee; Hitchcock, Reed, and Thomas, Democrats, and Weeks, Wadsworth, New, Frelinghuysen, and Sutherland, Republicans.

Senators Sheppard of Texas, Myers of Montana, and Kirby of Arkansas, all Democrats, put in the minority report defending the Administration and insisting that it has faced extraordinary difficulties that were not easily overcome.

Senators Fletcher, McKellar, and Beckman signed neither report.

W. A. MORGAN, LATE VICE-PRESIDENT OF THE CURTISS COMPANY, TELLS OF CONDITIONS THAT CAUSED AIRCRAFT PRODUCTION DELAY

IN a special interview with a representative of the New York *World*, Mr. W. A. Morgan, late vice-president of the Curtiss Aeroplane and Motor Corporation, discussed the conditions causing delays in production as follows:

"I joined the Curtiss Company on July 16 last. After sizing up the possibilities of the concern and talking to its staff of experts we went to Washington and consulted with the Aircraft Board as to the number of aeroplanes we could turn out. We figured conservatively that we could produce 3,000 pursuit 'planes and 1,000 bombers, from January 1 to July 1, 1918. The members of the Board said that if the $640,000,000 appropriation for our air service went through, they would give us a contract for that number of machines.

"At that time, understand, the appropriation had not yet gone through. But, relying on the word of the Board, we hurried back to Buffalo where I had taken an option on a piece of land and closed for it. The land and the necessary buildings for the work we purposed to do cost about $5,500,000. The Curtiss Company was not in a position to swing such a big deal and so I personally went out and borrowed $4,000,000 from a banking house. We got busy and began putting our buildings up within a few days. We had to send to Canada for some of the steel—but we got it into the country cheaper than we could have bought it here.

"Erection work was begun on July 27, and by September 15 we had 540,000 square feet of space inclosed. And up to this time we did not have the contract. I was staking everything on the word of the Aircraft Board.

Contract Signed, Then Cancelled

"The contract was signed on September 19. It was changed a little, so that it ordered 3,000 pursuit machines—fighting machines—and 500 heavier bombers. By November 2 we completed a second building and had a total of 1,170,000 square feet of space. We were ready to go ahead with our job—a $30,000,000 contract.

"But on November 7 last they cancelled the whole contract. This was because of the first of the many, many changes in design. The pursuit 'plane that we were to build was a copy of a certain French machine—a very good fighting 'plane which is still good enough to be in use in considerable numbers by the French. It was a single seater.

"But it seems that the Kaiser had sent some two-seaters over Verdun; that is, machines from which the pilot fired from the front and his companion had a second gun which he could fire at any 'plane which was chasing him. So the Aircraft Board immediately countermanded our order and set about to get a two-seater design. They accepted the Bristol, which is an English machine.

"We could have turned out the original 'plane ordered of us in great quantities very quickly. We could have begun production in December and got into quantity production in January, perhaps at the rate of 500 a month. We could have turned out any sort of 'plane they wanted, even the Bristol Fighter, at that rate, but we could not get the definite go ahead.

"My own belief is that it would have been far better to have made some of the original type; to have had 1,000 of them over there now protecting our lines, rather than to have none over there. We can't fight with designs. We have to fight with actual 'planes.

A Complete Halt

"Naturally, there was a complete halt when our contract was cancelled, but to make up for this cancellation the Board sent us word to go ahead and build 600 'planes of the 'advanced type.' This is a two-seated, dual-control machine which I may not describe in detail. But we showed them, with this ''plane,' what we could do in the way of production. We had a sample finished and in the air within ten days, and I believe the 600 have all been turned out and shipped by now.

"Finally we got our order for the Bristol Fighters. The contract was for 2,000.

"From the very beginning we were never able to get a definite 'go-ahead' order, so we could rush the production of this machine. We were, it must be remembered, maintaining immense overhead expenses. I personally was morally responsible for a $4,000,000 loan. Not that I cared so much about that. I'd give every cent I have to be able to feel that we'd turned out a great quantity of machines, that they were protecting our fighters, and that I had aided in doing this, as my contribution toward winning the war.

"Well, on November 28 the Executive Committee of the Curtiss Company wrote a strong letter to the Aircraft Board and told them that we were not responsible for any delays there had been, and that on account of these delays, which were not our fault, we felt that the Government should finance our operations—at least those extensions which we had made. This they agreed to do, and in January they took up our $4,000,000 mortgage.

Hundreds of Changes

"The changes that the Board ordered in the Bristol Fighter were literally hundreds. Their first great difficulty was about a motor. They decided primarily to use the Liberty eight-cylinder (which, as is now known, has been entirely discarded); but they found that would not fit in the Bristol. Then they decided upon a certain type of French motor, and then upon another type of French motor of greater power.

"These changes, of course, caused important changes in the machine, its balance and so on. Then they could not seem definitely to decide upon what sort of machine gun to use. They would order one kind, then another, then revert to the first again.

"This necessitated alterations in the machine proper and alterations in the gun mounts. Then a certain sort of instrument would be ordered and abandoned and another type ordered and abandoned. We never knew where we were—and here was a force of 11,000 men literally straining at the leash, ready to give all their strength and skill to the job of fast production."

"Any idea that reached here from abroad was seized by those in charge of our air programme," Mr. Morgan said. "It was a case of constantly copying something. In our air programme, I have found, no encouragement is given to American companies and American designers to produce something of their own.

"I do not want to appear to be holding a brief for the Curtiss Company alone. I know that all the others have had the same experience. But I do want to stick up for the American manufacturer in general, and I want to assert that we Americans can—and will if we are permitted—turn out as good aeroplanes as Germany does, and a great many more than Germany can turn out. We can produce enough to blind the Kaiser's armies if the authorities will let us go ahead.

No Trick to Do It

"It is no trick to turn out aeroplanes by the thousands—and I believe they will win the war—if the authorities will only decide what they want. But they hadn't the last I heard."

"What is the remedy for the situation?" Mr. Morgan was asked.

"Stop tinkering and let the manufacturers alone!" he replied. "As Mr. McNab of the President's Investigating Committee was quoted as saying the other day, if the authorities want to tinker let them get a big tract of land down in Virginia and tinker to their heart's content. Meanwhile the manufacturers will be producing."

MILITARY AEROSTATICS

HOW KITE BALLOONS DIRECT ARTILLERY FIRE

A CORRESPONDENT of the Associated Press, writing from "behind the British lines in France," describes his experience in a kite balloon observing artillery fire as follows:

"Would you care to go up?" asked the polite British officer in charge of the big kite balloon, one of the long line of captive sausages, the "eyes of the army," which swing as though pendant from the clouds all up and down the fighting line from the British channel to the Swiss border.

"Certainly," replied the correspondent, and so an extra warm overcoat and muffler were brought out and donned and, most important of all, the parachute harness was fitted on.

By this time the balloon had been connected up to the winch and everything was ready. The officer hoisted himself into the car with an agility born of long practice, while the visitor was assisted to his place by the "car men," who then hooked the harness to the parachute which hung just outside the little wicker car.

The Balloon's Equipment

Jutting out from one side of the car was a board on which was pasted a large-scale trench map of the district. In pockets inside the car were maps, air photographs and field glasses. On the rigging of the car was a dial to show the altitude and an indicator registering the force of the wind in miles per hour.

Just above, dominating all, was the huge bag of floating fabric, only kept in place by the crowd of soldiers holding the handling guys. The slender cable and its sister telephone wires stretched lazily across the grass to the winch on a big motor lorry nearby.

The observer fixed the telephone receiver to his head. He tested the line by calling up the winch party, the exchange and the chart room at the balloon section headquarters. Satisfied that all was ship-shape, he waved his arm to the flight-sergeant on the ground, who ordered crisply, "Let up hand over hand," and then, "Walk toward the winch."

Felt Shaky At First

The ground began to sink away. The first impression was that the bottom of the basket was going to fall out. For a few moments this impression was so strong that it was physically impossible to look over the side. The view was excellent, but the mood to appreciate it was absent. The officer's enthusiasm, as he pointed out different objects of interest in the landscapes, seemed somehow overdone.

Gradually this first impression of insecurity passed. The altitude dial, comfortably close at hand, now indicated that the balloon had reached 2,800 feet. The thermometer already showed a drop of twenty degrees. But the balloon was still rising.

"There is a light ground mist," explained the officer, "and experience proves that under such circumstances better results are obtained from higher altitudes." So it was not until the pointer signified 4,200 feet that he telephoned down the order, "Stop the winch," and the business of the day began.

Guided Battery Below

Artillery observation was the officer's appointed task. A British battery was going to "take on" a German battery, and the observer made his preparations accordingly. He had the positions of the two batteries marked on his map, but he wanted to make sure of the position of the balloon. So he leaned out over the side of the car, verified his landmarks and telephoned the results to the chart room.

"Let me know when they are ready," said he. There was a pause. Then a short monosyllabic conversation and the balloon officer gave the order, "Fire!" and adjusted his glasses to his eyes.

For the next fifteen minutes the officer was too busy to pay any attention to his passenger. He was engaged in "ranging," but from time to time he passed down a remark which showed that he was not confining his attention to ranging guns, but had also an alert eye for flashes of enemy guns anywhere within his range of observation. The range of vision was roughly twenty miles.

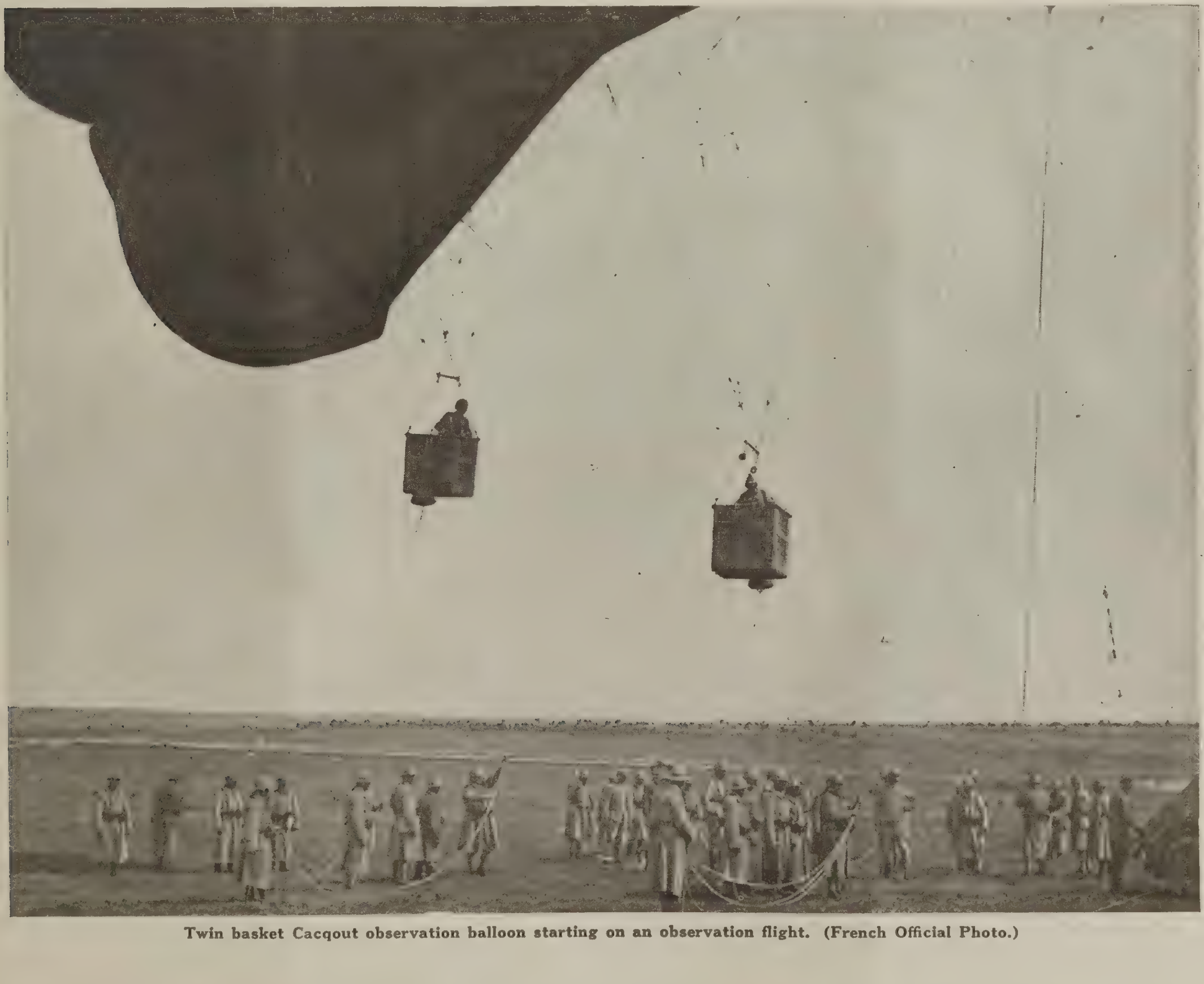
Phones Down Correction

After the first order to "Fire," a boom in the distance indicated that the order had been obeyed. The balloon officer frowned slightly, and telephoned a correction. A moment later the battery announced again that it was ready, and this time result was better. The process continued.

Once the observer asked to be put into direct communication with the battery, and the exchange arranged accordingly. Apparently the result of this conference was satisfactory, for soon the observation came through as correct.

A few more rounds and the balloon requested the battery to start firing for effect. While this

(*Continued on page* 264)



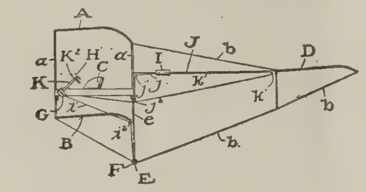
Twin basket Cacqout observation balloon starting on an observation flight. (French Official Photo.)

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,258,279. AEROPLANE. Frederick J. Veitch, New York, N. Y. Filed April 15, 1912. Serial No. 690,686. (Cl. 244—29.)

An aerocraft embodying a plurality of feight-carrying planes, a balancing plane in the rear of said weight-carrying planes, said balancing plane occupying an immovable position with reference to said weight-carrying planes, a lateral stabilizing and steering weight supported below the lower of said weight-carrying planes, means for controlling and adjusting the position of said weight with relation to said weight-carrying planes, a stabilizing vertical steering weight supported for movement between the weight-carrying planes and the balancing plane, and controlling means for shifting and retaining in position said vertical steering weight.



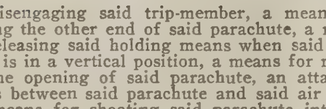
An aerocraft having independent slidable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and operative connections between the spindles and said movable weights.

An aerocraft having movable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and operative connections between the spindles and said movable weights.

An aerocraft having movable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and running cords operated by the spindles and connected to said weights.

1,258,356. AERIAL MACHINE. Albert W. Myers and Robert R. Fitz Gerald, Ottawa, Ontario, Canada, assignors to Albert W. Myers, Ottawa, Ontario, Canada. Filed August 29, 1917. Serial No. 188,853. (Cl. 244—21.)

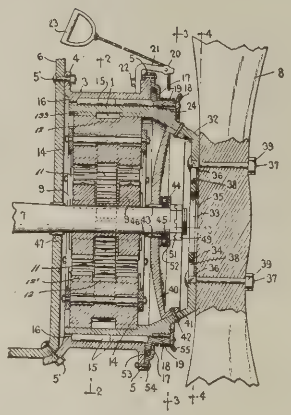
A safety attachment for aerial machines consisting of a parachute, a trip-member adapted to engage at the free end of the parachute, means for disengaging said trip-member, a means for holding the other end of said parachute, a means for releasing said holding means when said parachute is in a vertical position, a means for releasing the opening of said parachute, an attaching means between said parachute and said air craft, and means for shooting said parachute into the air.



1,258,450. AEROPLANE-STARTER. Merrill Pepperd, Wilmore, Kans. Filed September 5, 1917. Serial No. 189,826. (Cl. 74—54.)

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, and a flexible operating cable surrounding said oscillatory rim and attached thereto.

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, and a return spring for actuating said drum in the opposite direction.

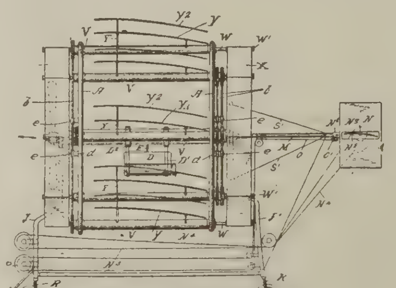


In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatamle drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, said pawl and ratchet means comprising a ratchet face on the drum, a pawl adapted to co-operate therewith and pivotally carried by said oscillatory rim, yieldable means normally holding said pawl out of engagement, and means operated upon by said cable serving to press the pawl into engagement with the ratchet face.

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, said pawl and ratchet means comprising a ratchet face of the drum, a pawl adapted to co-operate therewith and pivotally carried by said oscillatory rim, yieldable means normally holding said pawl out of engagement, and means operated upon by said cable serving to press the pawl into engagement with the ratchet face, said yieldable means also serving to press the last named means outwardly to permit the pawl to move out of engagement with the ratchet face.

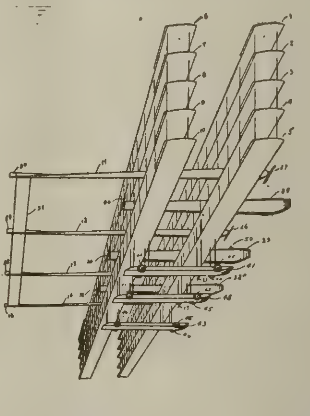
1,258,943. FLYING-MACHINE. Edmund Hugh Pryce, New York, N. Y. Filed December 15, 1911, Serial No. 665,906. Renewed July 30, 1917. Serial No. 183,638. (Cl. 244—14.)

In a flying machine, a central relatively stationary element, a frame mounted on said element and rotatable relative thereto, shafts carried by said frame and rotatable therein, supporting planes carried by said shafts to sustain the machine by the sustaining action of the air exerted through the rapid forward motion of the machine, means for automatically controlling the rotation of said shafts through the rotation of the frame relatively to the stationary element to maintain the planes in proper position to sustain the machine, and means for propelling said machine.



1,259,083. AEROPLANE. Isaac Covino, West New York, N. J. Filed October 25, 1917. Serial No. 198,529. (Cl. 244—14.)

An aeroplane of the multiplane type, having two sets of multiplanes, a tractor system of propulsion composed of four propellers and their respective motive powers located each on a separate body; said bodies being far apart so that equilibrium is maintained when flying; an after system of propulsion composed of three propellers with their respective motive powers all located at the rear end of the larger bodies, a horizontal rudder located at the rear end of the four tractor bodies, four vertical rudders located at the end of each of the four tractor bodies; landing wheels to allow aeroplane to move on land and pontoons to allow aeroplane to float and move on the surface of the water, all substantially as described.



(*Continued from page 263*)

was being done, another battery was rung up and ranging done on another target, the balloon observer occasionally switching his glasses to the old target to see that the guns were shooting correctly.

Now and again the observer passed down a message to the effect that "Blank-Blank is active." Blank-Blank was another hostile battery, not at present engaging attention. Sometimes he interpolated a little message for the chart room such as:

"Flash observed two five minutes left of Blank-Blank," Blank-Blank being a landmark easily found on the map, so that the flash position could be marked on the chartroom for attention later.

Results of the Work

There were four hours of this work before the officer gave the order, "Haul down." A slight jerk showed that the descent had begun, and fifteen minutes later terra firma was reached and the balloon was off upward again with a fresh crew.

Down in the chartroom the report of the day's work so far showed that three German batteries had been "neutralized" and two new battery positions discovered. In due course, the latter two would be cared for in a manner that would place them also on the list of neutralizations.

Not every balloon ascent is so smooth and peaceful as this. The enemy is active and ingenious, and the parachute is not there for nothing. The German airman, swooping like a hawk from a cloud, is always a possibility.

FOREIGN NEWS

AUSTRIA

The Cologne *Gazette* says that an aerial mail service is being established between Vienna and Kiev and also between Odessa and Constantinople.

CANADA

A Canadian *Daily Record* telegram reports that the first 1,000 aeroplane engines which are being built in Toronto, have been completed and tested. The engines are being constructed at a plant worked by the Imperial Munitions Board.

FRANCE

The French official statement for April 1st, reports intense aerial activity and the destruction of enemy aeroplanes, as follows:

"On March 29-30 our aviators, despite rain and mist, carried out numerous sorties. Five thousand kilograms of explosives were dropped on enemy cantonments and stations in the region of St. Quentin, Guiscard and Roye. Our aeroplanes frequently attacked with machine gun and bombs enemy concentrations, which they dispersed. Nine German aeroplanes and one captive balloon were destroyed by our pilots.

"Italian bombing machines took an active part in these expeditions, and recently carried out with splendid audacity numerous raids on the enemy lines."

The War Office issued a statement on aerial activity on April 3rd, as follows:

"On March 31 and April 1 French aerial squadrons threw down 12,000 kilograms (more than thirteen tons) of projectiles on railways and cantonments at Ham, Chauny, Noyon, etc. A large fire was observed in the railway station at Onauines. German cantonments in the region of Roye were bombarded with many projectiles and attacked with machine guns from a low elevation. French pursuit planes were engaged in many fights, in the course of which eight German aeroplanes were brought down. Two others were put out of action."

The announcement of April 7th reports French aerial successes:

"On April 6 seven German aeroplanes and two captive balloons were brought down by our pilots. Our bombers dropped 5,000 kilos of projectiles on enemy stations and cantonments.

Enemy airmen unsuccessfully attempted an early morning bombardment of Paris on April 2nd. An official communication says:

"Two flotillas of German aeroplanes crossed the lines flying toward Paris early this morning. They did not penetrate the Paris barrage defense, but made a half turn, dropping bombs in the suburbs. There were no casualties."

The official reports of aerial activity during Germany's great effort to break the Allied lines are very brief, but an indication of the magnitude of these operations can be gleaned from a United Press dispatch, which states that an Allied squadron of eighty machines pursued a German squadron of forty.

In the recent German aerial attack on Paris, one of the enemy aviators dropped a bomb which struck and damaged the embassy building of one of the Central Powers.

Two days later the caretaker of the building requested the legation of the neutral power representing the enemy's country to present a bill to the French Government for the damages done to the building.

France is asked to pay $900 for the destruction by the enemy of his own property.

Second Lieutenant Prince de Tonnay-Charente, one of the most promising young French aviators, is missing. He has brought down seven German machines.

GERMANY

Germany's aerial activity during the great offensive does not appear from the official announcements to be increasing in intensity. The official announcement of April 2nd, says:

"Twenty-two enemy aeroplanes and five captive balloons were brought down. Lieut. Kroll won his twenty-third aerial victory. By the energetic carrying out of long-distance observation from the coast as far as south of the Somme, aerial detachment No. 3, under Lieut. Friecke, rendered extraordinary service."

"Cavalry Captain Baron von Richthofen won his seventy-fifth aerial combat," says the German official announcement of April 3rd.

The War Office announced on April 7th that:

"In aerial battles eighteen enemy aeroplanes were shot down yesterday."

Dispatches to Les Nouvelles state that on the occasion of the last Allied air raid on Coblenz, twenty-six persons were killed and one hundred wounded. Great damage was done, the railroad station being demolished. In the last raid on Treves sixty were killed and hundreds were wounded, the railroad station was damaged and streets in the neighborhood were heaped with ruins.

In the raid last week the Cologne station was hit and many buildings were demolished. A troop train standing in the station was struck and many occupants were killed or wounded. The Emperor visited the spot the following day. A later dispatch from Geneva states that the recent British aerial raids on Cologne caused 248 deaths, half of whom were soldiers, according to the latest reports received at Basel. The soldiers were in a railway train bound for the Picardy front and standing at the Cologne station. Panic reigned in the city for twelve hours, the streets were deserted and the population hid in cellars. One report says that a Major was killed.

Emperor William was conferred upon Baron von Richthofen, the German aviator, the Order of the Red Eagle, with crown and swords.

GREAT BRITAIN

The British official statement for April 2nd reports aerial activity on the part of contact patrol and bombing squadrons, as follows:

"There was good visibility Monday and our low flying aeroplanes again were active. More than seventeen tons of bombs were dropped and thousands of rounds were fired from the air at the enemy's infantry and other targets on the ground. Hostile aircraft also were active on the southern portion of our front, some of their two-seated machines firing at our troops with machine guns from low heights.

"Ten hostile aeroplanes were destroyed and six others driven down out of control. Another aeroplane was brought down within our lines by infantry. Two hostile balloons were destroyed by our aeroplanes. Eleven of our machines are missing.

"After dark our night flying machines bombed enemy railway stations, billets, troops and transport, dropping many bombs on the Cambrai railway station, on the station southeast of Douai, on the railway lines south of that town, as well as on other targets. All of our machines returned."

The announcement issued April 3rd reports the following aerial activity:

"Hostile troops and transport on roads again were harassed Tuesday with bombs and machine gun fire. Over a thousand bombs were dropped during the day.

"The enemy's aeroplanes were fairly active between Albert and Moreuil. Thirteen German machines were brought down, eight were driven down out of control and three hostile balloons were destroyed. Seven of our machines are missing.

"At night rain fell continuously until 3 o'clock in the morning, after which time four and one-half tons of bombs were dropped on hostile billets and troops.

"Yesterday our aviators dropped seventeen tons of bombs and brought down sixteen German aeroplanes."

The official statement on aviation issued by the War Office April 4th says:

"Wednesday again was unfavorable for flying, but this did not prevent our aeroplanes from making several flights to reconnoiter the battle front and attack ground targets with bombs and machine guns. One fight occurred during a clear interval between two very large formations of our own and enemy machines. Otherwise hostile aircraft were not very active.

"Nine German machines were shot down, three were driven down out of control and one hostile balloon was destroyed. Five of our aeroplanes are missing."

The announcement of April 7th reports operations by large aerial units, as follows:

"About noon on Saturday our machines, watching the enemy's movements on the battlefront reported a concentration of hostile troops south of the Somme. Large formations of our aeroplanes issued immediately in the rain and dropped more than five hundred bombs on the enemy's assembled infantry, in addition to firing some 50,000 rounds at them with machine guns.

"In air fighting thirteen hostile machines were brought down and eleven others disabled. Two German machines also were shot down by anti-aircraft guns. Sixteen of our machines have not yet been located. Many of these undoubtedly made forced landings behind our lines, owing to the difficulty of finding their aerodromes in the heavy rain.

"Throughout the present battle the Canadian air force has done valuable work."

The British War office pays a high compliment to American airmen in the official statement issued April 3rd on aerial operations, which says:

"During the last fortnight of intense fighting in the air, the assistance rendered by the personnel of the American air service attached to the Royal air service has been invaluable."

A New York *Times* cable dispatch summarizes aerial activity during the great offensive, as follows:

"During the period from March 20-21 down to April 3-4, the British brought down at the front 240 German aeroplanes and drove down 123 out of control. During the same period the British had 122 machines missing.

"Excluding the bombs dropped in raids on Germany, British aircraft dropped during the same period 179¼ tons of bombs by day and 151 tons by night, a total of 300¼ tons. They also in the same period fired 1,139,525 rounds of ammunition from machine guns upon ground targets.

"When it is remembered that in order to fire upon ground targets the aeroplane has to take a special dive and in each dive fires only ten or twelve rounds perhaps, some idea can be formed of the enormous amount of work represented by these fighters. The maximum number of rounds fired at ground targets in a single day was 250,000, and in a single night 63,000. The maximum weight of bombs dropped during a single day was 31 tons, and in a single night 27¾ tons.

"In a single day one British brigade captured twenty-two German aeroplanes and drove down seven.

"Last month's long-distance bombing raids comprised thirteen British raids on German towns and only one German raid upon London."

How necessary the rapid building of aeroplanes is, can be gathered from the official reports of losses on all battle fronts during February, as reported by Associated Press correspondence. These totalled 361, of which 268 fell on the western front, eighty-five in Italy, four in Palestine, three in Macedonia and one in Mesopotamia.

The Allies report that 273 German and Austrian machines were brought to earth by Entente airmen, while the German Headquarters claim to have brought down eighty-eight Allied machines on the various fronts.

Losses for December on the western and Italian fronts alone were 390.

ITALY

American aviators are engaged in signal work on the Austrian front (in Italy), according to a despatch to the *Intransigeant,* of Zurich.

MODEL NEWS

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

LARGE scale models are rather uncommon among the average builders and we believe our readers will be interested in the six-foot scale model which is described by its constructor, Private Eugene J. McGuirk, Jr., a motor repair man in the Aviation Section, Signal Corps, U. S. Army. Mr. McGuirk's connection with the aviation division makes the model the more interesting, being so closely in touch with the full-sized aeroplanes of Uncle Sam's training stations. After being stationed at Kelly Field and Love Field Mr. McGuirk was transferred to the 196th Aero Squadron at Lake Charles, La.; from there he hopes to go "over the pond."

Specifications of the materials and construction of the McGuirk scout model are as follows:

Fuselage constructed of 3/16" square longerons and distance pieces of the same material. The curved fuselage top (or "turtle back") is built of cypress formers upon which is laid 3/16" by 1/32" spruce battens.

In the forward portion the fuselage is covered with sheet aluminum and the rear part with linen, which is doped and varnished after the manner of the large aeroplanes.

The pilot's cockpit is upholstered with leather and provided with a miniature aluminum seat.

All the controls are made to operate the controlling surfaces in the usual manner. Deep control is used—a wheel connected to the ailerons, the control column operating the tail-flaps or elevators, and a foot-bar for the directional rudder. The ailerons are hinged on auxiliary wing beams 1½ inches to the rear of main wing beam. This allows a slot to be cut into the main wing for the operation of the control lever.

From tip to tip, the main wings measure 72". The chord is 12" and the gap 13". Wing spars and entering and trailing edges are of spruce. Ribs are of the block-and-batten type, built up of very thin strips of spruce which are spaced by means of small blocks to form the proper wing curve; four such blocks being used in each rib. Rib spacing 1½" apart.

E. J. McGuirk's 6-foot scale model Scout.

Covering is with silk which is given three coats of varnish.

Wiring between the planes is similar to that employed on the famous French "Spad"; the wires cross at the center struts. Strut fittings are cut from sheet aluminum and turnbuckles are made of bicycle spokes and nipples.

In the landing gear, each wheel is made of two cupped discs of aluminum which are held together by a copper-tube hub, the ends of which are riveted to hold the halves of the wheel together. The tires are made of raw gum rubber. The axle is bound to the chassis with elastic, for the shock absorbing effect.

At the forward end of the fuselage, a dummy six-cylinder motor is set so that the tops of the cylinders project through the cowling. The motor is carved from a block of wood, the cylinders painted black to resemble cast iron.

Correspondence Model Club News

Edwin A. Jenkins, Mem. Secretary of the Corrsependence Model Aero Club, wishes to make public the fact that the Club is now preparing a "Spring Drive" for new members. The example of this organization might well be followed by other model clubs in an effort to stimulate increased interest in the science. Progressiveness is evidenced in the Correspondence Model Aero Club's continued activity, and all interested are urged to participate with it in the good work.

A bulletin is published by the Club, which is supplied without charge to members. Those who write to the Secretary, Edwin A. Jenkins, 1141 Bushwick Ave., Brooklyn, N. Y., will receive a sample copy of the Club bulletin together with full particulars about membership.

Scale models of Halberstadt Scout with a 30 inch spread and a Wright Flying Boat with a 36 inch spread. These models, built by Jacob Dunnell and W. B. Lane, were described in Aerial Age last week.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Some Rules for the Guidance of Hull Draughtsmen and Boat Builders

To Draughtsmen.

In getting out drawings for use of the Boat Shop it is advisable to make full size drawings as it makes easier work for the man to walk about on them to have a look at what they are supposed to build.

When laying off lines on the floor it is as well to use a good lump of chalk off the beach, broken up into fairly small pieces, so that they get well scattered and trodden in.

It is suggested that as at present we have no proper floor, the laying off might be done on the beach on a good clear stretch of sand; the tides will probably wash it out, but our draughtsmen have not much to do and might manage to get through the work in a few months.

If in doubt about what you have shown on any tracing ask one of the Hull Inspectors or Air Board D.O. what it really is; they are certain to be able to solve these little problems, if they cannot they will let you know in a month or two, or drop the matter altogether.

To Boat Builders.

This trade is a very simple one, although people are foolish enough to serve an apprenticeship to qualify; anyone with a small kit of tools and no common sense can work at it and produce a complete flying boat hull in a few days. (See our paper patterns.)

If you have not done any work of this sort before, and you have to buy tools, it is advisable to purchase heavy hammers, spanners, and cold chisels, etc., the work is light, but heavy tools last longer.

Never drill holes for driving copper nails into hard wood, the nails will drive quite easily; only drill holes rather larger than the nails to be used in soft wood, they can then be pushed in with the thumb more easily.

Rose burrs are only for decorative purposes, as long as they just hang on and are well driven into the wood they look all right.

The slots in screws are only meant for taking them out with; screws can always be driven in with a big hammer.

Planking joints need not be a good fit, as the two thicknesses of planking are only used to support the oiled calico in between.

Do not trouble to consult any drawings, these are only got out for the amusement of our Draughtsmen; it is as well to look occasionally at them as you would at a picture, it pleases the man who made them.

If you break a screw head off don't bother, glue in a dummy head so that it looks all right.

Put plenty of nails in planking, it does not matter if they are driven into anything else inside; they look nice and bright when the heads are filed off.

Colored putty and brown paper are good things.

Don't worry your Foreman or Charge Hand; they don't know any more about it than you do.

If you want any wood get it yourself. If it is cut into about six-inch lengths it is easy to split up for firewood.

When hulls are completed they should be sent to the Erecting Shop, where they will see that the varnish is well scratched up and the woodwork marked with heavily nailed boots. The fine finish is only put on the boats to keep the Boat Shop going.

Be accurate in your measurements in case the A. I. D. Inspectors level and plumb one of them up to see that one side is not more than three thirty-seconds of an inch wider than the other.

Always look out to be near the door when the whistle goes, the Canteen sprint gives you an appetite; it does not matter what time you start work again as long as you clock in.

"What dear little tires! How many miles do you get out of them?"

In the Future

She: "Say, porter, how long is this dark cloud we're coming to?"

Porter: "If youse couple am jes' married, about long enough for one, but if you hab been in that state for some time, ah should say long enough for about foah jabs on the jaw."—*Gargoyle.*

Evident

She: "That scar on your head must be very annoying."

Aviator: "Oh, it's next to nothing."—*Columbia Jester.*

Making Certain

Kernel: Did you bury all the dead as I ordered this morning?

Privit: Yes, sir, but we had a little trouble with one of them.

Kernel: What?

Privit: Why, one of them raised up on his elbow and said he wasn't dead, but then he was one of them d—d Germans, and you never can believe anything they say, so we buried him anyway.—*Awgwan.*

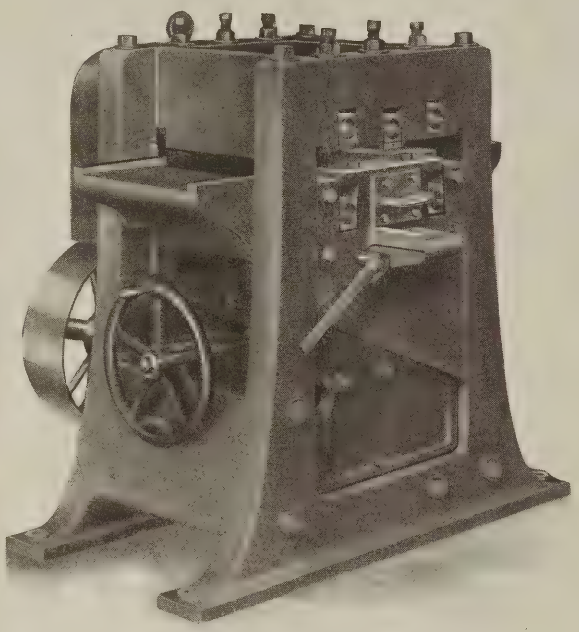
Not Yet

Alumnus of '78: "Who is that man over there with all the decorations? A French war hero?"

Fresh: "Naw, that's a guy that subscribed to the two Liberty loans, the Friendship Fund, the Army 'Y,' the Prison Camp Drive and the Red Cross Society."—*Gargoyle.*

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a



Whitney Scraping and Toothing Machine

WHITNEY

Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog and samples of toothing

Baxter D. Whitney & Son

WINCHENDON MASSACHUSETTS

S

Silver, Eugene W	SLR; CRI
Stevens, Wade	SLR; KST
Scott, Walter	SLR; KST
Speed, William George	SLR; KST
Shear, Coman Knight	SLR; TFT
Shackleton, Allan Doughtery	SLR; RSD
Sneckner, Leonard Anderson	SLR; KST
Smith, Kent Hale	SLR; CWT
Sturrock, Walter	SLR; CWT
Shaffer, William Luman	SLR; KST
Stoddard, David Izatt	SLR; RSD
Stocking, Miles Hausch	SLR; PMT
Slaughter, James Marshall	SLR; HHN
Skidmore, Andrew Allen	SLR; CWT
Sager, George W	CSO
Seifert, Frank W	FRF
Slocum, Winfield Scott	SLR; KST
Shirey, Walter Hampton	SLR; CWT
Snyder, John Abner	SLR; KST
Sweeley, Lester Julian	SLR; RWT
Steil, Fred H	FRF
Stewart, Robert S	FLR; AEF
Snodgress, David Little	SLR; KST
Smith, Landis S	FRF
Slaven, Lant Rader	SLR; KST
Scott, Alfred Clark	SLR; KST
Shields, Fred Milton	SLR; KST
Shoemaker, Louis Jack	SLR; KST
Spitzer, Ray Carlton	SLR; KST
Schulein, Benjamin Miller	SLR; KST
Stoddart, Herbert Allen	SLR; TFT
Sclotzhauer, Harry A., Jr	FLR; AEF
Stewart, Walter James	SLR; RWT
Sawyer, Herbert Smith	SLR; KST
Smith, Edson Bernard	SLR; KST
Smith, John Robert	SLR; DIK
Smith, Harry Glenn	SLR; CWT
Slater, Harry Edward	SLR; KST
Sutcliffe, Robert	SLR; PMT
Spencer, Eldridge T	FRF
Scott, Rufus Fenner, Jr	MAJ
Stevens, George	MAJ
Smith, Chandler	SBI
Shaffer, Oscar N	CWT
Stedman, Nathan Alexander	SLR; TFT
Smiley, David Binns	SLR; PFO
Stolze, Charles W	CAP
Schmidt, Victor	FLT
Stoddard, Marvin Homer	SLR; CWT
Smith, Westcott Timpson	SLR; CRI
Said, Mark	SLR
Sargent, Edmund B	SLR
Scales, George W	SLR
Scoville, Irving N	SLR
Searles, Harolde N	SLR
Sloss, Louis, Jr	SLR
Smith, Walter L. G	SLR
Snodgrass, Maynard H	SLR
Snyder, Maynard H	SLR
Snyder, Don Vernon E	SLR
Snyder, Kenneth Mac G	SLR
Southwick, Philip O	SLR
Stein, Louis H	SLR
Stoddart, John C	SLR
Swift, Russell F	SLR
Sloane, John E	FLT
Soule, Horace	CAP
Schneider, Albert J	FLR
Schreiber, Ernest Frederick	SLR; CWT
Sultan, Thomas Preston	SLR; GLC
Scantlin, Thomas Edgar, Jr	SLR; GLC
Smith, Clarence B., Jr	PFO
Sloan, Samuel Addison	SLR; RSD
Smith, Paul Roscoe	SLR; KST
Sherman, Alza C	SLR; CWT
Spalding, Vaughan Clarke	SLR; KST
Stewart, Haven Charles Rex	SLR; KST
Southworth, William A	FLR
Stanley, Leonard L	FLR
Seydel, Fred	MAJ
Sweeney, Hart Temple	SLR; KST
Sullivan, John M	SGS
Scott, Curtis F	FLR
Smith, Lawton V	CAP
Smith, Fred H	FRF
Sturdivant, Edwin R	FRF
Stewart, Walter J	FRF
Sine, Byron Albert	FLR; CDT
Slade, Arthur J	CAP
Saxe, William V	FLR
Schadt, William F	SLR
Sanders, William C	SLR; DIK
Sherman, Alesea C	DIK
Steele, Cyrel H	DIK
Shaw, Robert Ross	CAP
Suggs, Henry Lee	FLR; PFO
Smith, Bruce E	FRF
Spake, Ralph E	FLR; AEF
Sulivan, Henry Bissell	SLR; RSD
Sweeley, Lester J	FRF
Scantlin, Thomas E., Jr	DIK
Sultan, Thomas P	DIK
Smith, Paulding	DIK
Sargent, Carl A	DIK
Schanck, Rollin N	FRF
Smith, Paul P	DIK
Smith, Walter J	FLR; AEF
Snyder, Floyd	DIK
Schreiber, Earnest F	DIK
Stoddard, Marvin	DIK
Small, Sydney F	Detroit, Mich. JRC; Note 1
Sewell, Robert B	FRF
Slauson, Frederick C. T	FRF
Southworth, Gilbert S	FRF
Spencer, Frederick G	FRF
Savage, Arthur Henry	SLR; CAF
Smith, Frank Arthur Cushing	SLR; CAF
Strong, James Henry Ward	SLR; CAF
Sutton, Harold Putnam	SLR; RSD
Schroeder, Frederick Amandus	SLR; KST
Sanders, James O'Hear	SLR; CWT
Sears, Louis Albert	SLR; DIK
Stees, Donald Bower	SLR; DIK
Steele, Cyril Hilding	SLR; CWT
Schlatter, Donald W	FRF
Smith, Wayne G	Note 9
Smith, Hugh L	FRF
Smith, Pauldin	SLR; CWT
Schweser, Elmore C	SLR
Seaman, Lewis F	SLR
Shaw, Donovan L	SLR
Sibbernsen, Albert H	SLR
Squiers, Bard MacD	SLR
Starring, David S	SLR
Snyder, Floyd	SLR; CWT
St. John, Alvin M	SLR; KST
Stokes, Charles Pickett	SLR; KST
Stanley, Walter S	FRF
Stauffacher, Earl M	FRF
Saunders, Minott F	FRF
Schaupp, John Martin, Jr	SLR; CWT
Stoddard, Walter A	SLR; KST
Seiler, Frederick E	FRF
Searle, Ralph O	FRF
Stevenson, Francis L	FRF
Simpson, John M	FRF
Tompkins, John L	FRF
Steele, John L., Jr	FRF
Sheffield, Frank H	FRF

T

Townsend, Edward I	SLR; DIK
Thomas, William C	FLR
Thomas, John	SGS
Thomas, Walter Grant	FLR; RWT
Tighe, George Raymond	SLR; TFT
Tonkin, Thomas Cecil	SLR; KST
Tatnall, Emmett R	SLR
Taylor, Nathaniel Landon	SLR
Taylor, William W	SLR
Taylor, Henry Bowman	SLR; SBI
Taylor, Harold L	PFO
Taylor, Edward Clark	SLR; CRI
Taylor, Ratcliffe	SLR; RSD
Taylor, Henry H	FRF
Tuttle, Waldo E	FLR
Thompson, Seth Waldo	SLR; SBI
Thompson, Roland Sanford	SLR; CWT
Thompson, Roland S	SLR; DIK
Thompson, Thomas W	SLR
Thorne, Henry Sanford	SLR; AAD; FRF
Thorne, Gordon Comstock	SLR; TFT
Trent, Simeon V	SLR

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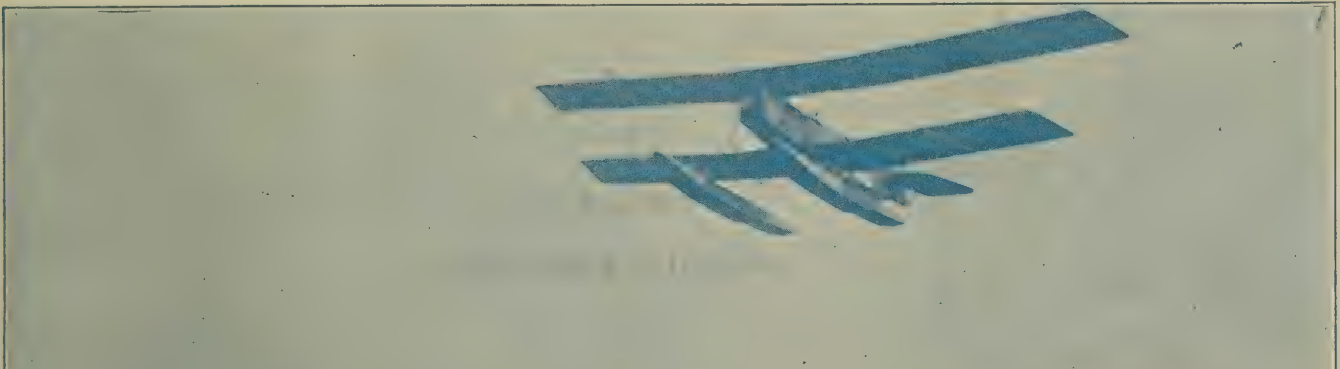
AERIAL AGE WEEKLY

Vol. 7, No. 6 APRIL 22, 1918 10 CENTS A COPY



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Soldiers and sailors cheering the maneuvres of a naval aviator at Key West, Florida.

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Allies More in Need of Planes Than Soldiers

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>
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>
> **Dated, March 30th, 1918.**

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> **"Conclusion:—These beams carried a much greater transverse load than solid wood beams of the same material and section. The glue joints between web and flanges are stronger in shear than the web section, and the glue had fairly good waterproof qualities. These beams show the superiority of the laminated construction over the solid construction as to strength and great saving in material."**
>
> **Dated, March 11th, 1918.**

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ALLIES MORE IN NEED OF PLANES THAN SOLDIERS

Major Gordon P. Howe, Back From Picardy Fighting, So Announces

"OF course, it is as an airman that I say this, and there is a shadow of a chance that I may be wrong. But it seems to me that we need aeroplanes from the United States even more than we need men. This, mark you, though the skies over the Picardy lines are so thick with them that one might almost say the sun is obscured."

Major Gordon P. Howe, of the British Flying Corps, offered this comment on the present European situation. He arrived at an American port on his way to Canada, invalided home after three and a half years at the war front. He has served a year each in infantry, cavalry and aviation corps and dropped to the ground from shell shock on the third day of the present German offensive. He is 29 years old.

"Whatever I may tell you about the conditions in air fighting up to the time I was brought down," said Major Howe, "is bound to be inadequate, even though I was there myself and saw. It must be incredible, I'm sure, to be told that the air over the fighting front is so sown with planes of every sort, and dirigibles, too, that driving one is as difficult as manœuvring a car down Fifth avenue on a crowded afternoon; but I am stating an actual fact.

"As many of our men have been brought down from collision as from gunfire. We have the ascendency over the Germans so far, and I hope it lasts. But we need more planes; as fast as you can turn them, and not by the hundreds, but by the thousands."

Air Scene Described

One of the first to reach this country with an actual participant's account of the present fighting conditions, Major Howe reiterated again and again that his description did the facts imperfect justice.

He said that when Von Hinderburg's great drive began the Germans threw out before and above their armies a fleet of scout and battleplanes so vast as to justify the inference that they must have considered it insuperable. It was met by an allied resistance in the air which even Major Howe, taking part in it, had not believed possible, and for the first forty-eight hours of the mighty conflict the air-fighters struggled for the mastery on fairly equal terms.

It was upon the third day that the defenders began very slowly to gain. It is the belief of Major Howe that they still hold the ascendancy, and he bases this on what he heard up to the day he left France and on his own observation that the German airmen in general lack the initiative and inventiveness of their opponents and that at times their organization seems inadequate to the task they undertake.

"It is singular that they should have gone short in the matter of organization. One has heard and still hears so very much of German organization and its infallibility. Still, by the third day, having started out more than equal with us, they were being shot down almost continuously and their reserve planes were not coming up.

Unable to Fill Gaps

"We had bombed a number of their hangars and munition depots, and of course they were on the offensive and their armies pressing steadily forward. Nevertheless they seemed unable to fill the gaps made in their air ranks. Possibly they had not expected to suffer so many gaps and had made no provision against them, or else they had not expected night fighting in the air, which we kept up unremittingly.

"In any event, while I was still in the fight, they were making frantic efforts to re-enforce their machines with machines from other sectors and for some reason, which I do not know, were not succeeding. They began sending up their smaller and medium dirigibles on the second day, and of course, with the fighting so thick in the air, these suffered instantly.

"You may imagine the character of the fighting when I explain that in the immediate neighborhood of the firing lines the difficulty was as much to get into the air as to stay there afterward without being hit. It was precisely like wedging one's car into heavy city traffic without the benefit of the traffic rules.

"Collisions were constant and as often fatal. There is no way of describing it and making the description convincing. The air was full of fighting craft of every manner and kind."

Major Howe had been in the air twelve hours without once coming down, when he was hit; and was a little out of the thickest of the fighting, having gone back over the German lines.

His Fight With Enemy

"I was attacked on two sides, or rather from before and above, when I was put out of it. There was a heavy fighting machine forward of me and I had gone in pursuit of it when it turned and came back to meet me. While we were both firing another German plane assailed me from above. Neither he nor the one ahead was able to hit my machine, but the man above finally let a bomb drop, which exploded right beside me.

"Although I was not hit by any part of the shell, the concussion rendered me unconscious, and when I regained my senses I was in a hospital. I have no idea how I got to the ground, but men who saw it all told me that I retained control of my machine until it was a few feet from the earth. I must have guided it subconsciously. Such things are not uncommon.

"I wish to add just this more. Even after all they have been through there is no fear in the minds of the allied fighting forces as to the final outcome either of the present battle or of the war. None whatever."

EDITORIAL COMMENT ON AIRCRAFT SITUATION

Aeroplane Mistakes

(Editorial in New York *Evening Post*)

The Senate Military Committee's findings against the Administration in the matter of aeroplane production fall under two general heads. There has been a failure to realize attainable efficiency, and this failure has been aggravated by official promises and reports altogether misleading in their excessive optimism. On the second count there is not much that can be said in rebuttal. From Secretary Baker down there has been altogether too much readiness to fall in with popular conceptions of an enormous aviation programme that could be realized by a *tour de force* of American inventive ingenuity and hustle. Mr. Baker has himself to blame for the natural reaction that has followed upon the circus flourish with which the "invention" of the Liberty motor was given to the world. Mr. Baker might have remembered that the man in the street would not stop to differentiate between training planes, flying planes, and battle-planes, when he was assured several months ago by Mr. Baker that the aeroplane programme had reached the stage of quantity production. It is somewhat too late for the minority report of the Senate Committee to emphasize the enormous complexities and minutiæ of aeroplane building—the necessity of planting great acreages in India for the growth of the oil-seed for motor lubrication, the establishment of factories for the production of aeroplane varnish, the importation of mahogany from the tropics. All these things should have been kept in mind by the war officials in their communications to the public.

Putting aside all unreasonable expectations raised by official loquacity, it is still true that in the realization of even a moderate programme there have been disappointments. There has been too much shuffling of plans. Presumably, this arose from the same desire for perfection which entered into the machine-gun situation, and which in the case of the Browning gun has been justified by the comparatively slight delay, and by the fact that there was concentration on a single technical problem. The advocates of the Browning gun knew exactly what they wanted. The aeroplane alterations and delays have arisen from an excessive experimentation in war-time. But beyond that we find evidence of an actual lack of co-ordination on the administrative side. We can understand why the War Department should have decided to manufacture its battle-planes in France and should have sent over a large force of American mechanics for the purpose, while concentrating production in this country on trial planes and fast machines. But in that case we should not have sent over to Europe 1,200 flying cadets, of whom the Senate Committee reports that only 450 have received their primary training for lack of planes, and the others may have to be brought back.

There is a fundamental consideration which underlies our aeroplane mobilization as it underlies our effort in the matter of men, guns, food, and raw materials. This principle is a simple one. It consists in formulating our plans in accordance with the advice and the desire of the Allies. The transfer of our troops to Allied leadership is only the most striking example of this programme of ready service. The Allies asked us to send men for whom they would supply the guns and equipment, and we have done so. The Allies asked for the shipment of raw material and labor in preference to the finished product as a means of saving time and tonnage, and we have complied. Take this question of battle-planes. On our failure to produce them the heaviest weight of criticism has fallen. Yet the hostile Senate Committee report states:

Arrangements have been made with France for the construction there of 6,000 battle-planes by 7,000 American mechanics sent across the ocean for the purpose and using 11,000 tons of American material.

Why was not this plan made known to the American public? The knowledge that American labor is occupied in building battle-planes out of American material in France would obviously have been the answer to the charge that up till now we have shipped just one battle-plane to France.

The situation, therefore, is one in which mistakes of administration have been greatly aggravated by unhappy publicity methods. The mistakes of management must be remedied, and doubtless will be remedied on the basis of the two Senate reports and the findings of the President's special committee. But it is essential, and it is not too late, to give the public a true idea of the problems involved in the execution of our aviation programme, and on the other hand to remove the unjustified apprehensions that have been created by the "breakdown" of that programme. It is not true, as partisan critics have tried to make us believe, that our men in France are facing the enemy without aeroplane protection. We have the use of the Allied battle-planes just as we have the use of Allied guns. We are not making rapid progress toward the ideal of 20,000 American planes that were to win the war, but that was always a counsel of perfection, and has been pushed into the background by immediate needs. A simple statement from authoritative quarters that we have had more need to think of men and food and shipping than of aeroplanes would have saved the Administration a large measure of unjustifiable criticism.

Our Delayed Aeroplanes

(Editorial in New York *Evening Sun*)

About as thorough in condemnation as any official opinion on the war preparations given out since the start is the report of the Senate Committee on Military Affairs, dealing with the record of the Signal Corps in regard to aircraft production. If good comes of the report's recommendations, the Signal Corps will be set back at its old work of making signals, and a single, absolute and forcible person will get the job of turning out aeroplanes as fast as he can, with something extra of speed to make up for lost time.

The man can be found. He will probably have to spend some busy days and nights learning, as to aeroplanes, a slight part of the technical lore that the Signal Corps could not forget. Aviation being new, we lack a community of practical aviation men, such as our communities of railroad men, steel men, mining men and banking men. The technical equipment of the man who is to translate our aircraft plans from paper to fact will count for less than his driving power. Let us have a man who knows what he is after, in a matter-of-fact even if not in an elaborate way; one who means to get it; one who can by dint of his faith and power in his own purpose move the mountains of subordinate indifference, cut the entanglements of organization red tape and force a thoroughfare through the conflicting claims of other activities.

The damage done by delay need not occupy our thoughts any longer. It would need discussion only if any one, outside of Mr. Creel, doubted the delay in aircraft construction. The minority report presents so cold and artificial a defence of the Signal Corps as to reveal quite pitilessly its signers' own adverse conviction in the face of their perfunctory make-believe. The Signal Corps is condemned.

Once we agree what is wrong, the need of the hour is the remedy. The Senate's committee, with its sweeping proposal, has found the right plan for supplying the lacking aircraft in the shortest time possible.

It will profit nobody if the report of the Senate Committee on Military Affairs about our failure to produce aeroplanes for war service is treated merely as a contribution to the files of the document room. The report reveals what the committee very temperately describes as a "gravely disappointing situation." We need not dwell upon the details of the conditions the committee found to exist. The disappointment to the country will not be softened by anything contained in the minority report signed by three Democratic members of the committee. They merely set up in palliation of the shortcomings in aeroplane production the very great difficulties encountered in the work. In time of war men must be found who can overcome difficulties.

The important thing now is to end the country's disappointment, to win success where the record thus far is largely one of failure. The facts are before Congress, before the Administration. The recommendation of the committee is that "the matter of production should be taken out of the hands of the Signal Corps entirely," that it "should be controlled by one executive officer appointed by the President and responsible to him." The recommendation and the report cannot be ignored. The matter is far too serious for any further exhibition of a "certain aloofness in dealing with persons possessing information based upon experience" to which the committee report refers as one of the causes of failure. Mistakes have been made, very serious mistakes, that cannot be denied. They should be frankly admitted and promptly corrected. That is the best way out of a pretty bad situation. That way will best satisfy the country, it is the best way to hasten the production of aeroplanes for use of American soldiers in France.

THE NEWS OF THE WEEK

Colonel Raynal C. Bolling Missing

Colonel Raynal C. Bolling, former general counsel for the United States Steel Corporation, who as a junior officer of the National Guard organized the first National Guard aero unit in this country in 1915, and who for years has been one of the most prominent advocates of aerial preparedness in America, was named in the list of missing cabled from France by General Pershing. Colonel Bolling is the highest ranking American officer to be reported in an American casualty list since the United States troops went into action.

Mrs. Bolling, who is at her home in Greenwich, Conn., said she had received no information other than that contained in General Pershing's cablegram and a notification from the War Department. She seemed to be hopeful that better news would be forthcoming within the next few days.

Colonel Bolling was born in Hot Springs, Ark., forty-one years ago, and is a Harvard graduate of the class of 1906.

In the Spring of 1915, Colonel Bolling, then a First Lieutenant in the Signal Corps of the National Guard of New York, organized the First Aero Company of the guard in this country. The company was mustered into the Federal service at the Garden City Aerodrome on July 13, 1916, following a period of training at the Hempstead aviation field. The organization of the squadron was made possible through the generosity of prominent New Yorkers who contributed $59,000, through the Aero Club of America, for its equipment. Of this sum Mrs. William H. Bliss gave $10,000 and William K. Vanderbilt $1,000.

Andes Mountains Crossed in Aeroplane

Lieutenant Cendelaria, of the Argentine army, April 15 crossed the Andes by aeroplane from Zapala, Argentina, to Curico, Chili, a distance of 180 kilometres (112 miles). The machine crossed the mountains at an altitude of 3,200 metres (10,500 feet).

This is the first recorded crossing of the Andes by aeroplane. On June 24, 1916, a balloon, operated by Captain Zuloaga and Engineer Bradley, crossed the Andes from Santiago, Chili, to Uspallata, Argentina.

Allan A. Ryan Named Police Defense Head

Allan A. Ryan, son of the late Thomas F. Ryan, and a member of the Board of Governors of the Aero Club of America, was appointed by Commissioner Enright as special deputy commissioner in charge of national defenses, without salary.

Mr. Ryan is the third millionaire to join the Police department without pay, the others being John A. Marris, special deputy in charge of traffic, and Rodman Wanamaker, special deputy in charge of the police reserves.

Since the war began he has taken a deep interest in the defense of the city. As special deputy commissioner he will be responsible for guarding the water fronts, docks, tunnels and bridges, in conjunction with Inspector Thomas V. Underhill, who has been in charge of the division of national defense.

Mr. Ryan is a native New Yorker. He was born here, May 5, 1879, and was educated at Stony Hurst Academy, England, and Georgetown University, Virginia.

Virginia-New York Flight in Liberty Plane

Driven by a Liberty motor at an average speed of 100 miles an hour, an army aeroplane arrived at Mineola from Langley Field, near Norfolk, Va. The time for the flight as given in a statement issued on March 15 by the Aero Club of America was three hours and fifteen minutes. The statement added that Major Roy S. Brown, an expert army pilot, and George Buzan, a Liberty engine expert, were the passengers. The distance between Langley Field and Mineola is about 325 miles.

The aviators started from Langley Field, near Norfolk, Va., at 11 o'clock sharp. Rising high, they reached a height of 12,000 feet after passing Baltimore. The air was exceedingly cold there, and they came down lower, and the flight averaged 6,000 feet for the rest of the journey.

They easily reached Long Island and found Mineola, and landed at Mineola Field No. 1, where they were received by Major Canady, Major Thomas Hitchcock, and other officers, who welcomed them.

Almost the first question asked of them as they landed was about the Liberty motor. The motor never missed a stroke during the entire trip. It is one of the motors made by the Packard Company, and both Major Brown and Mr Buzan were enthusiastic over the performance.

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A "Blimp" doing its bit in the Liberty Loan drive over New York City. Thousands of appeal circulars were dropped over the city.

Major General Squier Detailed as Member of Joint Army and Navy Board

Washington.—By direction of the President, Major General George O. Squier, Chief Signal Officer of the United States Army, has been appointed a member of the Joint Army and Navy Board "on aeronautic cognizance." Colonel Henry H. Arnold has also been assigned to the same duty.

Official Review of Naval Aviation

Washington.—In an official statement for the "Official Bulletin" reviewing the year's war activity, the Navy Department makes the following report on naval aviation:

"There has been marked progress in the development of naval aviation. Orders have been given for sea planes, flying boats, dirigibles, and balloons. The above material is being built in private establishments and also at the naval aircraft factory in Philadelphia. This factory was authorized by the Secretary of the Navy July 27, 1917. On August 6 the first contract for factory buildings was let, and on August 10 ground was broken for the first building. The first machine turned out by this factory was completed on March 1. Additional machines will follow in rapidly increasing numbers until about June 1, when it is expected to turn out at least one complete machine a day.

"The outbreak of the war found the Navy well supplied with materials required for the then existing enlisted personnel and for the upkeep of the vessels of the fleet, a heavy demand having been anticipated.

"With the rapid increase in enlisted personnel, the laying down of additional destroyers and small craft, and the conversion of large numbers of merchant vessels, extensive additional purchases of all kinds of supplies, materials, and munitions were necessary. The demands for such additional materials have been successfully met."

Enemy Takes First American Aviator

Amsterdam.—The Germans have made their first capture of an American aviator, a semi-official Berlin despatch reports. He is said to have been shot down on the western front on Sunday.

The American aviator is described as an engineer by profession, who since September of last year has served with the French forces.

Aeroplane Mail Service in Russia

Washington.—A report has been received from Russia that the first aeroplane mail experiment from Petrograd to Moscow, a distance of 400 miles, was successful. The trip was made in 5½ hours, and 300 lbs. of mail were carried. Four aeroplanes now fly daily in both directions, and service to other cities is contemplated. The postage fee is $1 per letter.

Furniture Company Making Aeroplane Parts

Grand Rapids.—A new three-story addition to the Luce Furniture Co., to be used in the construction of aeroplane parts, has been completed.

© International Film

A French pilot about to start on a bombing trip over the enemy lines in Serbia paints his aerial bombs with the names of two American cities in honor of two Americans flying with the squadron

Piano Factories to Make Aeroplanes

Washington.—The War Industries Board reached an agreement with piano industries to curtail production 30 per cent in April and May so as to create additional facilities for aircraft work which the piano factories will take up. Priority orders have been issued in favor of lumber shipments from sawmills to the piano factories which will manufacture aeroplanes.

Board Appointed to Grant Air Licenses

Washington.—The board which will grant civilian licenses to operate aircraft has been announced. It includes Major-Gen. George O. Squier, chief signal officer of the army, as chairman. The other members are Col. H. H. Arnold, Signal Corps; Lieut-Col. Claude E. Brigham, Coast Artillery, and Capt. Noble E. Irwin; Capt. T. R. Y. Blakeley and Capt. F. H. Clarke to represent the navy.

All aviators except officers of the army and navy, must obtain licenses from this board for the operation of balloons, seaplanes or aeroplanes.

Aircraft Heads New Priority List

Washington.—The War Industries Board, of which Bernard M. Baruch is chairman, has issued what it terms "Preference List No. 1," which lists 44 trades that are to be given priority in the delivery of coal and coke. The list makes no mention of automobiles or trucks and the omission of these products is understood to have been because of the tacit agreement made the first week in March by which automobile manufacturers agreed to a reduction in output of 30 per cent and that they would be allowed sufficient fuel to produce the remaining 70 per cent.

The issuance of the list, which is essentially a revision and extension of lists previously issued by the Fuel Administration, is not causing any apprehension. Manufacturers believe that under the terms of the March agreement they will be permitted to get all the fuel they require. No interference with fuel deliveries has been felt to date.

Preference List No. 1 is "for the guidance of all governmental agencies in the supply and distribution by rail or water, or coal or coke." The statement issued with the list states that the board has not undertaken to classify any industry as non-essential or at this time to limit the quantity of fuel which any particular industry or plant shall receive. The industries which are listed "will be accorded preferential treatment by the Fuel Administration in the distribution of coal and coke. The same plan will be followed in according preferential treatment to war industries and plants in the transportation of raw materials and supplies." The statement makes plain that the Priority Commissioner may certify additional classes of industries and additional plants whose operation as a war measure is important. Following is a list of preferred industries:

List of Preferred Industries

Aircraft—Plants engaged exclusively in manufacturing aircraft or supplies and equipment therefor.

Ammunition—Plants engaged in the manufacture of ammunition for the United States Government and the Allies.

Army and navy cantonments and camps.

Arms (small)—Plants engaged in manufacturing small arms for the United States Government and the Allies.

Chemicals—Plants engaged exclusively in manufacturing chemicals.

Coke plants.

Domestic consumers.

Electrical equipment—Plants manufacturing.

Electrodes—Plants producing electrodes.

Explosives—Plants manufacturing.

Farm implements—Manufacturers exclusively of agricultural implements and farm operating equipment.

Feed—Plants producing feed.

Ferroalloys—Plants producing.

Fertilizers—Manufacturers of fertilizers.

Fire brick—Plants producing exclusively.

Food—Plants manufacturing, milling, preparing, refining, preserving, and wholesaling food for human consumption.

Food containers—Manufacturers of tin and glass containers and manufacturers exclusively of other food containers.

Gas—Gas producing plants.

Guns (large)—Plants manufacturing.

Hemp, jute, and cotton bags—Plants manufacturing exclusively hemp, jute, and cotton bags.

Insecticides — Manufacturers exclusively of insecticides and fungicides.

Iron and steel—Blast furnaces and foundries.

Laundries.

Machine tools—Plants manufacturing.

Mines.

Mines—Plants engaged exclusively in manufacturing mining tools and equipment.

Newspapers and periodicals—Plants printing and publishing exclusively newspapers and periodicals.

Oil—Refineries of both mineral and vegetable oils.

Oil production—Plants manufacturing exclusively oil well equipment.

Public institutions and buildings.

Public utilities.

Railways.

Railways—Plants manufacturing locomotives, freight cars and rails, and other plants engaged exclusively in manufacture of railway supplies.

Refrigeration—Refrigeration for food and exclusive ice-producing plants.

Seeds—Producers or wholesalers of seeds (except flower seeds).

Ships (bunker coal)—Not including pleasure craft.

Ships—Plants engaged exclusively in building ships (not including pleasure craft) or in manufacturing exclusively supplies and equipment therefor.

Soap—Manufacturers of soap.

Steel—Steel plants and rolling mills.

Tanners—Tanning plants, save for patent leather.

Tanning extracts—Plants manufacturing.

Tin-plate—Manufacturers.

Twine (binder) and rope—Plants producing exclusively binder twine and rope.

Wire rope and rope wire—Manufacturers.

The Multiple Storage Battery for Aeronautic Uses

Many necessary electrical appliances have recently been added to the list of aeronautical instruments and equipment, but the problem of providing the proper source of current for such accessories appears to have been avoided by most battery manufacturers. In the last three years many storage battery makers have, of course, made experiments in an effort to produce a battery suitable for use on aeroplanes, but the necessary high degree of reliability in addition to the desired light weight has been difficult to attain.

Experiments on lightweight batteries exclusively for aeroplanes have been made by Mr. N. D. Sturges, President of the Multiple Storage Battery Company of New York, with the result that a battery of exceptional merit has been perfected. This is a 12-volt 50-ampere-hour battery, which is said to be the first one to come within the 40-lb. weight limit set by U. S. Government specifications. Besides being the lightest practical battery of its capacity ever built, its ability to stand up under severe conditions of service imposed upon it for starting, lighting, ignition and wireless, makes it particularly suitable for aeronautic use.

The multiple battery is of approved construction, assembled in separate hard-rubber jars, and follows the standard method of automobile starting battery construction. The improvement which has made its production possible lies in the manufacture of a light-weight battery plate which has more capacity than the ordinary plate used in starting batteries, and the same durability. The battery is capable of a steady current output of 20 watt hours per pound of element, which is far in excess of any other battery, and 50% lighter in weight than the average automobile starting battery.

The principles of construction are not entirely new, as they have proven their good qualities in giving constant satisfaction over a period of years. Overall dimensions of multiple storage battery for aeronautic use are: Length, 9¾"; width, 6½"; height, 8¼". The plates are 1/16" thick, 9 to a cell and six cells to a battery, i.e., 54 plates.

The production of a battery of such desirable characteristics furnishes a practical source of current for all electrical equipment desired on aeroplanes and opens up a new field of development along this line. This radical departure of cutting down the weight on storage batteries should aid materially all aeroplane builders because of the importance of reducing weight to a minimum.

Chanute Field News

Rantoul, Ill.—Lieut. Col. Fredrick M. Jones, who has been in command of the Chanute Aviation Field since last fall, has been ordered, with several other aviation officers, to over seas service. Colonel Jones has already left Chanute Field. Other aviation officers who is accompanying the Chanute chief are Major W. B. DeArmond, commander of the Scott Field at Bellville, Ill., and Major Owen Aleshire, commander of the Hazelhurst Field at Mineola, N. Y. A remarkable coincidence is that these three officers are old pals and were for many years together in the Twelfth Cavalry.

Major George Krapf, who has been stationed at Wichita Falls, Texas, has been ordered to Chanute and will have command of the local flying field. Major Krapf was formerly the commandant of the United States School of Military Aeronautics at the University of Illinois and is a West Point graduate.

Twenty non-flying officers from here have been ordered to the Armorers' School, which has been established at the Wilbur Wright Flying Field at Dayton.

Secretary of the Treasurer McAdoo has requisitioned the services of Major Maurice Connolly, one of the officers of Chanute Field. Major Connolly is desired to assist in the campaign for the Third Liberty Loan for a period of two weeks after April 15, and Secretary of War Baker has granted this request. Major Connolly, who is a former Congressman from Dubuque, Ia., has been in Washington, D. C., on leave following a long illness.

"Garabed's" Fate to Be Settled

Washington, D. C.—The long expected demonstration of "Garabed," that machine which it is expected to grasp unlimited energy from the air and distribute it cheaply for a multitude of power units, is, according to its inventor, Garabed T. K. Giragossian, about to take place.

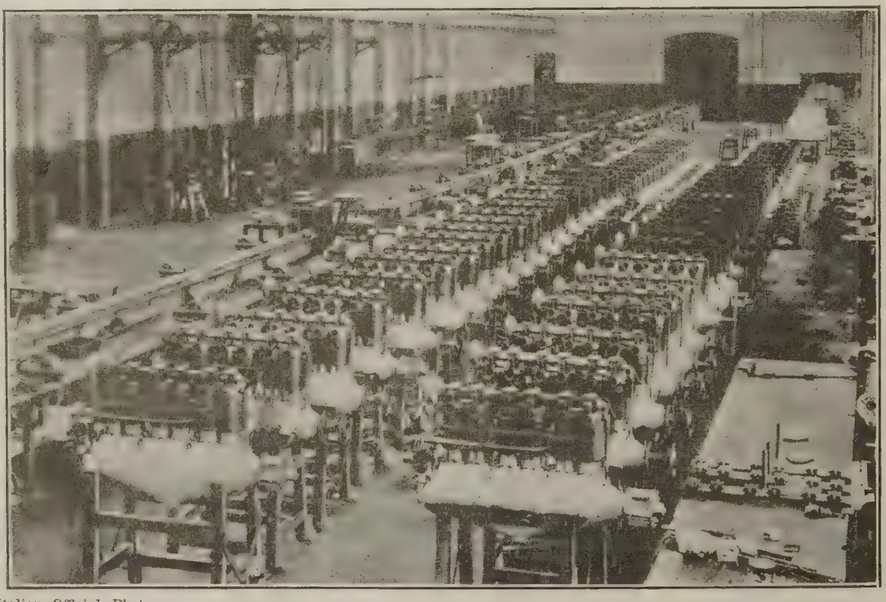
The machine has been almost wholly rebuilt for the purpose. Giragossian states that he is not permitted to divulge the time or place.

Georges Carpentier Recovering from Aero Accident

Georges Carpentier, champion French heavyweight pugilist, who is recovering from wounds in the head, sustained during an aeroplane accident, has given up all thought of coming to the United States to box during the period of convalescence and will devote his time to teaching physical culture and boxing at the Normal Gymnastic School of Joinville.

Wardrop Lectures to Many Organizations

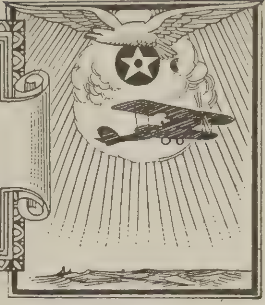
During the last few days G. Douglas Wardrop, editor of Aerial Age, has lectured on aircraft in warfare to the following organizations and clubs: The Alumni Society of Columbia University, the Twilight Club, the Rainy Day Club, the American Society of Mechanical Engineers, the Society of Engineers of Eastern New York, and the Boston Engineering Society.



Italian Official Photo

Final assembly of a batch of S. P. A. motors at the S. P. A. factory in Italy.

NAVAL and MILITARY AERONAUTICS



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Tex.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1.—Report to points named for temporary duty in the order given.
Note 2.—Report to Chicago; Fort Worth, Tex.; EOT; Note 1.
Note 3.—Report to engine and repair depot, Dallas, Tex.
Note 4.—Report to Dayton, Ohio; then Chief Signal Officer, Washington.
Note 5.—Take station at Detroit, Mich.
Note 6.—Report to Indianapolis, Ind,
Note 7.—Report to district manager of Equipment, 104 Lindsey Building, Dayton, Ohio.
Note 8.—Proceed to Fort Monroe, Va.
Note 9.—Report to chief, military intelligence section, General Staff, Washington, D. C.
Note 10.—Report to commanding general, Eastern Department, New York, N. Y.
Note 11.—Report to commanding officer, Western Department, San Francisco, Cal.
Note 12.—Report to general supply depot, Atlanta, Ga.
Note 13.—Report to Duesenberg Motors Corporation, Elizabeth, N. J.

Special Orders 74 to 79 inclusive

A	
Aaron, Robert L.	FRF; TFT
Arthur, Rex P.	TFT
Alder, George Washington	SLR; TMA
Aldredge, Sawnie Robertson	SLR
Andrews, Edward W.	FRF
Allen, Greff	SLR; TMA
Allen, Arthur W.	SLR
Adams, George W.	SLR
Austin, Fred	SLR; CAF
Albertson, Edwin Russell	SLR; LDT
Allen, Charles Edward	SLR; KST
Alfonte, James R.	CWT; WCS
Armour, Philip Danforth	SLR; GLC
Avent, Ira M.	SBI
Arnold, Leslie P.	SLR
Austin, Charles B.	SLR
Adams, William Arthur	SLR; GLC
Aaron, Samuel Arthur	SLR; EOT
Alton, Robert Leslie	SLR; GLC
Adams, John Willard	SLR; EOT
Abbey, Henry, Jr.	CRI
Allison, Stanton W.	SLR
Arrington, Walton M.	SLR
Abels, Walter J.	ELA
Adams, George Walter	SLR; FOB
Arthur, Rex P.	PFO
Allen, Arthur Williams	SLR; KST
Anderson, Harry B.	MAJ
Axley, Lowry	KST
Alfonte, James R.	MAJ
Annan, Duncan	GLC
Atkinson, Bert M.	MAJ
Appleman, Earl	SLR
Appleton, James L.	SLR
B	
Bradford, Henry Earle	SLR; PFO
Bittinger, Howard Paul	SLR; TFT; Note 1
Branneke, Augustus M.	TFT
Black, Orlando Bacon	SLR
Black, Robert O.	SLR; DIK
Baumberg, Charles Anthony	SLR; KST
Barnes, Paul Verner	SLR; KST
Burns, Thomas R.	FRF
Burke, Charles Francis	SLR; KST
Burke, Francis Xavier	SLR; ELA
Bughman, Henry Clay, Jr.	SLR; KST
Beehler, Charles H.	TFT
Bell, George E.	TFT
Bigelow, James L.	TFT
Brooks, Edward J.	TFT
Burrall, Hallett J.	TFT
Bausher, John G.	FRF
Birdsall, Carl A.	CRI
Blackmer, Lawrence M.	SLR; DIK
Bartlett, Treffley F.	SLR
Brady, Cletus J.	SLR
Brainerd, Fred Lindley	SLR; KST
Branson, Raymond Lee	SLR; KST
Bressman, Earl Norman	SLR; KST
Bowman, John M.	FLR
Bratton, Howard, Jr.	SLR; EOT
Broderson, LeRoy	CAF
Byerly, Frederick M.	FRF
Blackburn, Thomas W.	FLR
Burney, Otto F.	SLR
Bruner, Donald Lloyd	SLR; KST; (2)
Butterworth, Benjamin Thomas	SLR; KST; (2)
Brennan, James Dennison	SLR; SBI
Brooks, John B.	SLR; SBI
Bimm, Henry Lee	SLR; SBI
Bonnevalle, Richard William	SLR; LDT
Bibb, John Taylor, Jr.	SLR; LDT
Burch, Mark Hoyt	SLR; AAD
Brooks, John B.	SBI; WCS
Butterfield, Harold Homer	SLR; LDT
Barbee, Stanley N.	SLR
Batchelder, William W.	SLR
Bramhall, Maynard	SLR; EOT
Benson, Philip	SLR
Beresford, Paul C.	SLR
Blackburn, Lloyd C.	SLR
Blanchard, Carelton W.	SLR
Blackmer, Laurence M.	SLR
Blurton, Melvin R.	SLR
Boyle, John P.	SLR
Brewer, Kenneth E.	SLR
Brown, Ray B.	SLR
Burns, Ruel F.	SLR
Behncke, David L.	SLR; CRI
Bailey, Henry P.	SLR
Becker, Joseph F.	SLR

Bobbitt, Daniel F..........SLR
Boley, Austin Francis..........SLR; KST
Begni, Tito..........SLR
Bonner, James L..........SLR
Bowler, Harry N..........SLR
Bentley, Frank H..........SLR; HHN
Brush, Spencer..........SLR
Bufkin, Charles C..........SLR
Burtt, Howard J..........SLR
Bloom, Edward L..........SLR; CRI
Bergh, James R..........FRF
Bond, George C..........SBI
Barnes, James G..........SLR
Buchanan, James P..........SLR; CRI
Borncramp, Wendell E..........FLR
Brader, George A..........FLR
Bruner, Donald L..........DIK
Benson, Robert H..........SLR; CRI
Hillard, Arthur M..........FLR
Brecka, Frank V..........KST
Bruce, Warren R..........FLR
Bradford, George L..........SLR; HHN
Boggs, Willis A., Jr..........SMM
Boyd, Millard J..........KST
Burnham, Stanley..........BST
Benham, Reid Fenimore..........SLR; LDT
Brooks, Wilbur F..........FRF
Betaing, Hiram H..........CUI
Brett, George H..........MAJ
Brereton, Lewis H..........MAJ
Brown, John..........MDO
Brown, Harry M..........MAJ
Brown, Roy S..........MAJ
Brown, William C. F..........FRF
Brooks, John B..........MAJ
Brooks, Martin V. B..........WFO
Brooks, Walter E..........SLR
Bartholf, John C. P..........MAJ
Burdick, Earl K..........SLR
Burton, Joseph W..........FRF
Baskey, Earl F..........GLC
Ball, Charles H..........SLR
Ballard, Audrey B..........SLR
Bergh, James R..........SLR
Bertrand, Lloyd W..........SLR
Black, Robert O..........SLR
Blanchard, Leslie D..........SLR
Boothby, Wallace J..........SLR
Bower, Raymond G..........SLR
Bushnell, T. Corbus..........DIS
Boots, Norman J..........MAJ
Burwell, Harvey, B. S..........MAJ
Butts, John W..........MAJ
Benedict, Charles C..........MAJ
Boettcher, Arthur..........MAJ
Burney, Otto Franklin..........SLR; RWT
Bowen, Thomas S..........MAJ
Barnitz, Richard B..........MAJ
Buchanan, James Dewar..........SLR; Note 3

C

Cranford, Joseph O..........SLR; KST
Coyle, Frank J..........FRF
Charlton, Donald Hopple..........SLR; TFT
Cunningham, Bruce Wallace..........SLR
Cole, Dausa Webster..........SLR; RWT
Cavender, Frank..........SLR
Cox, Leon Clark..........SLR; KST
Camp, Julian W..........FRF
Crawford, Wilbur Francis..........SLR; KST
Cramer, Ira W..........PFO
Cook, Thomas F., Jr..........SLR; DIK
Clark, Roger P..........FRF
Calhoun, Abner Welborn..........SLR; KST
Coleman, Wiley L..........FRF

Joseph S. Bennett, the manager of the Curtiss Aviation School at Miami, Florida.

Callaghar, Robert Lawrence..........SLR; KST
Cutter, Edward B..........FRF
Carson, Robert Hugh..........SLR; KST
Cutts, George F..........TMA
Clark, Wallace Thomas..........SLR; KST
Crummey, James J. M..........FRF
Crissy, John C..........SLR; DIK
Carlin, John F..........DIK
Charles, William Kemp..........SLR; CWT
Carpenter, Frederick S..........FLT
Craig, Alexander, Jr..........SLR; KST
Caldwell, Joe H..........SLR
Crissey, John Charles..........SLR; CWT
Case, Harold S..........SLR
Carlin, J. Francis..........SLR; LDT
Chilton, Ralph H..........SLR
Cole, Dausa W..........SLR; DIK
Chadwick, Stuart..........FRF
Clarke, DeFrance..........SLR; CAF
Coates, John F..........FLR
Collins, Raymond Brien..........SLR; CWT
Calef, Robert C..........FRF
Clark, Harold L..........SLR; TFT
Coleman, DeWitt..........FLR
Cleveland, Robert L..........SLR; TFT
Carrington, Cabell..........FLR
Crawford, Daniel M..........SLR; TFT
Claggett, Ralph B..........SLR
Curry, James T., Jr..........SLR; TFT
Clark, Allen..........SLR
Clark, James G..........SLR; CRI
Coleman, LeRoy A..........SLR
Clark, Ralph S..........FLR; FRF
Carney, Harry B..........FLR
Crafton, Jesse A..........FLR; FRF
Cooper, Alfred C..........FLR

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Receiving a message radioed down from the air by aviators on practice observation flights

Craig, Thomas J..........FLR; FRF
Callaway, Richard..........FLR; FRF
Cox, Frank W..........FLR
Caraway, Talmadge E..........SLR; CAF
Clark, George S..........TFT
Culp, Alexander P..........SLR; WFO
Clement, Frederick P..........TFT
Caldwell, Harold Benjamin..........SLR; KST
Clark, John Everett..........SLR; KST
Campbell, Horace Leslie..........SLR; LDT
Campbell, Elmer Bentley..........SLR; KST; (2)
Chase, Eugene Paul..........SLR; CSO
Carusi, Joseph Silvus..........SLR; KST; (2)
Cheak, Charles Wesley..........SLR; DIK
Cameron, Burr S..........SLR
Campbell, Don M..........SLR
Carroll, Lee J..........SLR
Chadbourne, Reuben J..........SLR
Clapperton, George D..........SLR
Clark, William J..........SLR
Cleary, Leslie A..........SLR
Cline, Richard E..........SLR
Cripe, Elmer S..........SLR
Crouch, Norman S..........SLR
Cleveland, Lyman Warren..........SLR; LDT
Cooper, Walter Whipple..........SLR; KST; (2)
Castle, Otis Henry..........SLR; SBI
Chapin, Harry Taylor..........SLR; KST
Clanton, Bernie Dean..........SLR; KST
Cole, Franklin Everett..........SLR; KST
Castle, Harvard D..........FLR
Cainon, Cutler J..........SLR
Cahn, Henry E..........SLR
Calvert, Cecil B..........SLR
Carrithers, Harry H..........SLR
Chamberlin, Morgan G..........SLR
Chapman, George A..........SLR
Carroll, J. Harold..........SLR
Conklin, Claude R..........SLR
Cousins, Wayne K..........SLR
Crary, Roy P..........SLR
Cowan, John..........SLR
Comer, Braxton Bragg, Jr..........SLR; RII
Carvin, Charles Walter..........SLR; DIK
Colleton, Thomas Emmett..........SLR; LDT
Chirieleison, Frank..........SLR; FRF
Clark, William H..........SLR; WFO
Collier, David C..........SLR; CRI
Cupp, Robert O..........SLR; CRI
Cunliffe, William H..........SBI
Carroll, Thomas J..........KST
Crist, Donald L..........SLR; KST
Crocker, George A., Jr..........REV; CSO
Churchill, Walter A..........MSC
Cook, Seth W..........SBI
Canady, Earl L..........HHN; WCS
Carter, Paul Burton..........SLR; KST; (2)
Clark, Halford..........SLR; LDT
Campbell, Elmer B..........DIK
Clark, John E..........DIK
Carr, James F..........SMM
Cameron, David..........SLR; LDT
Cleary, Maurice G..........SMM
Caldwell, Joe Hardwick..........SLR; KST
Chilton, Ralph Henry..........SLR; KST
Churchill, Lawrence S..........MAJ
Claggett, Ralph Bernard..........SLR; RWT
Clark, Allen..........SLR; RWT
Cortright, Edgar M..........FRF
Christopher, Luke..........FRF
Clark, Harold M..........MAJ
Cary, Edward A..........GLC
Chapin, Charles G..........GLC
Connel, Samuel M..........GLC
Cook, Charles I..........GLC
Chambers, Stewart M..........FRF
Connor, William B., Jr..........FRF
Cousins, Ralph P..........MAJ
Christie, Arthur R..........MAJ
Curran, George A..........SLR
Capron, Theodore J..........SLR
Canady, Earl..........MAJ
Caulkins, Ralph M..........KST
Colby, Oliver M..........SLR
Coleman LeRoy Astor..........SLR; Note 3
Caulfield, Sidney W..........Note 13

D

Dwight, Henry William..........SLR; TFT
Dryden, Ralph..........FLR
Dillin, Forrest H..........SLR; CWT
Devoe, John M..........FLR
Donaldson, John Owen..........SLR; TFT
Darlington, Frank..........SLR
DeFrates, LeRoy Charles..........SLR; KST
Drake, Robert A..........SLR
Dyer, Edwin Lawrence..........SLR; KST
Dole, Arthur..........FRF
Dee, Lawrence Taylor..........SLR; KST
Davis, Raymond E..........TFT
Drennan, Walter R..........SLR; KST
Deaton, Ernest A..........SLR
Drake, Joseph W..........FLR; KST
Dudley, Walter B..........SLR
Dudley, Lloyd M..........SLR; TFT
Cogswell, Daniel B..........KST
Dudley, Lyman O..........FLR
Duffy, James W., Jr..........FLR; FRF
Davis, Edward Lawrence..........SLR
Dimmick, Harold E..........SLR; CAF
Dippy, Robert N..........FLR
Davies, Stuart Johnson..........SLR; DIK
Dougherty, Francis Marion..........SLR; EOT
Daniels, Emory C..........SLR
Dick-Peddie, William S..........FRF
Durkee, Hugh Bentley..........SLR; BST

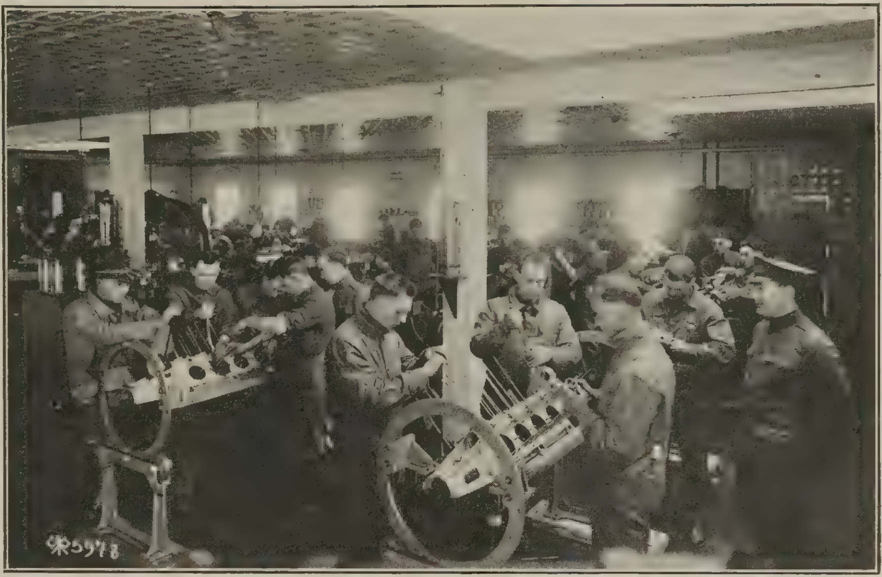
Davenport, William H....SLR
Darr, Harold S....SLR; BST
Dennis, William V....SLR
Dole, Arthur, Jr....SLR; GLC
DeVilleneuve, Jules....SLR
Dahman, Wallace Werneth....SLR; KST
Ditty, Cecil A....SLR
Duke, Leslie Burton....SLR; KST; (2)
Downing, Clyde C....SLR
DeCourcy, William Earl....SLR; EOT
Doyle, John C....SLR
Dounce, Clifford Buckman....SLR; KST
Duffield, LeRoy B....SLR
Dean, John Raymond....SLR; GLC
Dugas, Graham C....SLR
DeHart, James....SLR; FRF
Dean, John R....FRF
Diebel, Alfred J....SLR; KST
DelGaudio, Mathew W....SGS
Daniell, William I....SMM
Dietz, Philip....FLR
Desmond, James P....PFO
Dauchy, Theodore H....SLR
Davis, Charles T....SLR
DeHart, James....SLR
Desmond, James P....SLR
Diggins, Ralph C....SLR
Dodge, Walter E....SLR
D'Archy, James, Jr....SLR
Dimmig, Howard....SLR
Dunn, Thomas F....FRF; SLR
Denmark, Leonidas P....FRF
Duffield, LeRoy B....FRF
Dudley, Walter Bailey....SLR; RWT
Davidson, Howard C....MAJ
Dorwart, Frederick G....KST
Deaton, Ernest Aubrey....SLR; KST
Deuel, Thorne, Jr....MAJ
Dunsworth, James L....MAJ
Davis, Michael F....MAJ

E

Edgerton, George Wilson....SLR; KST
Eddins, Rufus Roy....SLR; CRI
Estabrook, Frederick R....CSO
Ensign, Ralph Holcomb....SLR; CRI
Enright, Walter J....CUI
Ellison, James Arthur....SLR; TFT
Ellis, Lyman R....TFT
Eaton, Irving....SLR; KST
Eaton, Leland Watson....SLR; KST
Eckel, Jacob Edward....SLR; KST
Ewing, James Carl....SLR; KST
Evans, Edward M....SLR
Everest, George F....SLR
Erickson, Harry A....FRF
Easterling, Anthony M....SLR
Edwards, Claude C....SLR
Emerson, Alfred C....SLR
Erregger, Charles J....KST
Erwin, William P....FLR
Edwards, Claude R....FRF
Eaton, Samuel C., Jr....SBI
Elbert, Robert G....KST
East, Whitten J....MAJ
Ellis, Richard W....FRF
East, John H....FRF
Ernst, Norman C....GLC
Epperson, Arthur R....GLC
Evans, Walter G....KST
Emmons, Delos C....MAJ
Elliott, Howard....Note 10

F

French, Jasper....TFT
Foulk, Albert Carl....SLR; EOT
Flaherty, Morgan James....SLR; KST
Fulghum, Henry E....SLR
Feuchtwanger, Paul Jerrold....SLR; TFT
Faircloth, Edward C....SLR; FRF
Fuhrman, Daniel K....FRF
Fields, Curtis P....SLR; DIK
Floyd, George D....FLR; TFT
Ford, Jay Banbury....SLR
Farwell, Albert D....FLR; WFO
Frindel, Samuel....SLR; WFO
Frans, Elmer West....SLR
Feast, Harry C....SLR; CAF
French, John Taylor....SLR
Ferguson, William W....SLR; CAF
Frost, Ezra, R., Jr....SLR; CAF
Fitzsimmons, Samuel G....FLR
Fort, Frank B....SLR; FRF
Fraser, Kennth G....SLR; TMA
Friedly, Jacob D....SLR
Fitch, James Carlos....SLR; LDT
Fredell, George B....REL; Note 11
Felts, Jess Alonza....SLR; KST
Fisher, Albert Leslie....SLR; EOT
Furman, Earl F....FRF
Friedman, Max H....FRF
Farley, Earl T....KST
Foster, Carl A. C....FRF
Frankenberg, Edward S....SLR; WFO
Few, Lindsey D....SLR
Foque, Edwin N....SLR
Foster, Harold G....SLR
Foster, Harold G....SLR
Franklin, George T....SLR
Flagg, William J....SLR
Friedly, Jacob Durr....SLR; RWT
Feuchwanger, Paul J....FRF
Ferron, Paul L....MAJ
Fidler, Charles F....SLR
Forseth, Albert J....SLR
Foster, Ralph F....SLR



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Students at the Engineering School at Mineola, Long Island, are being taught aeroplane motor assembling

Frandsen, Arthur S....SLR
Friedman, Max H....SLR
FitzGerald, Shepler W....MAJ
Frissel, Patrick....MAJ
Fowler, Thomas....REL; Note 12
Fulghum, Henry Edgar....SLR; DIK

G

Gwyer, Kingsley VanAlstyne....SLR; HHN
Goldsborough, William C....FRF; SLR; DIK
Glenn, Charles Ephraim....SLR; CWT
Gilmore, Otis Lydell....SLR; KST
Gamble, Henry Clay....SLR
Goodier, Lewis E., Jr....CSO
Gottschall, Roy W....CRI
Gorman, Karl H....RSD
Green, Harold Irving....SLR; HHN
Goos, Carl N....SLR; DIK
Garner, Jack Asbury....SLR; KST
Guthrie, Harry Conn....SLR; KST
Green, Guy W....FRF
Greever, John J....SLR
Gregory, Clifford E....FLR
Gailor, Frank H....SLR
Gardner, Roy B....SLR; CWT
Gibson, Peyton....SLR; TMA
Gilbert, John W....SLR; FRF
Gillett, John D....SLR; CAF
Garoni, Rudolph....TFT
Gillin, James M....KST
Gray, Ralph C....TFT
Garland, Arthur Henry....KST
Gary, Winder....SLR; KST
Gibson, Edward Branford, Jr....SLR; LDT
Gregg, Harry W....CSO
Gardner, John H....SLR
Goos, Carl N....SLR
George, Harold L....SLR
Graham, Charles, Jr....SLR
Gregory, Alexander S....SLR
Griffith, Clyde Irving....SLR; DIK
Greenwood, Samuel Albert, Jr....SLR; LDT
Gould, Richard Hartshorn....SLR; LDT
Gilkeson, Adlai H....WFO
Grover, John Hill....SLR; KST
Gross, Edward Henry....SLR; KST
Ganey, Daniel Francis, Jr....SLR; KST (2)
Gatton, Cyrus J....FLR
Geisse, John H....SLR; CRI
Graves, Thomas E....FRF
Gardiner, Robert R....SLR
Gardiner, Harold A....SLR
Golding, George W....SLR
Gary, Winder....DIK
Gross, Edward H....DIK
Grimes, Gerald E....PFO
Garrett, Ellis Clyde....SLR; DIK
Gillingham, Joseph E....KST

Some of the employees of the Standard Aero Corporation after taking the oath of fealty, administered by Judge Conolly, Union County District Court

Gearhardt, Guy L.	MAJ
Greever, John J.	SLR; KST
Gillespie, Eugene F.	KST
Gilkeson, Adlai H.	MAJ
Gates, Percival T.	SLR
Graham, Joseph A.	SLR
Gaelaas, Rudolf L.	FRF

H

Hoffman, Verne W.	SLR; TMA
Happ, Clarence W.	TFT
Hodgson, Harold C.	TFT
Horrell, Camden R.	TFT
Humphrey, Watts S.	TFT
Harrison, Matthew	SLR; SMM
Hymer, Herbert Arthur	SLR; SMM
Hyndshaw, Silas Clearman	SLR; SMM
Hartney, John Francis	SLR; CGC
Harding, Clifford L.	SLR
Healy, Joseph E.	SLR
Henrici, Max	SLR
Herbert, William C.	SLR
Hart, Marion Francis	SLR; KST
Henzy, Urban L.	SLR; KST
Herlihy, Harold Walter	SLR; KST
Hoffman, Jacob VanDorn	SLR; KST
Hiett, Ralph W.	SLR
Hubbard, Walter J., Jr	SLR
Hostetler, Wilbur D.	FRF
Hopper, Charles Emery	SLR
Harris, Charles Lane	SLR; KST
Hogen, Frank Grant, Jr	SLR; KST
Hosmer, Fred Ernest	SLR; ELA
Haines, Richard Sidwell	FLR; CSO
Haight, Edward M.	FLR
Harrison, George R.	CSO
Houston, Henry H.	FRF
Hale, Herbert J.	FRF
Haugen, Lauritz G.	FLR; SMM
Hiestand, Benjamin	SLR; CAF
Horner, Harold A.	SLR; CAF
Harris, William L.	SLR; TMA
Hecht, Irving Tressell	SLR; KST
Hoefgen, Leonard Edward	SLR; KST
Hughes, George P.	FRF
Hutterly, Andrew J.	FRF
Hardy, Richard LeRoy	SLR; KST (2)
Horrell, William A.	CSO
Hager, Daniel Irvin	SLR; KST
Harriman, Walter Franklin	SLR; KST
Holladay, Daniel Macdonald	SLR; DIK
Holliday, William Jaqueline	SLR; KST
Harrison, George Alexander	SLR; KST
Hamilton, Arthur G.	FRF
Henderson, Vincent dePaul	SLR; SBI
Harrington, Robert C.	FRF
Hoefgen, Leonard E.	PFO
Hardy, Richard	DIK
Heinman, Herbert E.	KST
Hendricks, George F.	FRF
Hadden, Frank E.	SLR
Harrison, Dwight, Jr	SLR
Harvey, David C. B.	SLR
Hodges, Clarendon K.	SLR
Holloway, Phil R.	SLR
Hose, George H.	SLR
Halley, Harold A.	SLR
Harris, Allan B.	SLR
Hart, Floyd H.	SLR
Hogel, Milton H., Jr	SLR
Hood, Daniel G.	SLR
Hoyt, Howard C.	SLR
Huber, Howard F.	SLR
Hulsing, Harry W.	SLR
Hart, Floyd H.	FRF
Hamilton, Stewart A.	SLR; WFO
Hall, Robert K.	FRF
Heyden, Arthur L.	SBI
House, William R.	SLR; HHN
Hill, Maurice M.	FLR
Hermes, Theron B.	FLR
Hardendorf, James R.	FLR
Hull, Kenneth D.	KST
Hardy, Eugene J.	FLR
Heydron, Harvey G.	SBI
Hollander, Harvard F.	FLR
Hager, Daniel I.	DIK
Hecht, Irving T.	DIK
Hayden, Thomas E.	SLR; WFO
Himbeaugh, Gero L.	PFO
Hoffman, Charles A.	GLC
Harris, Joseph M.	FOB
Harding, Clifford Lee	SLR; PWM
Hyland, George N.	FRF
Hall, Howard A.	SLR
Hamilton, Arthur G.	SLR
Harris, Joel G.	SLR
Heafer, Harold W.	SLR
Hedlund, Theodore E.	SLR
Hendricks, George F.	SLR
Hendricks, Harold H.	SLR
Hooks, Arthur J.	SLR
Hyland, George N.	SLR
Healy, Joseph Evart	SLR; KST
Henrici, Max	SLR; KST
Herbert, William Curtis	SLR; KST
Hubbard, Walter John, Jr	SLR; KST
Hibben, Robert C.	MSC
Heard, Jack W.	MAJ
Hiett, Ralph Waldo	SLR; KST
Howard, Clinton W.	MAJ
Hansen, Harry L.	GLC
Horne, George W., Jr	GLC
Hopkins, Lionel D.	GLC
Hendee, Henry D.	SLR
Hough, Romelyn B.	KST
Horton, Elwood	HHN
Hardon, Tolbert F.	MAJ
Harmon, Millard F., Jr	MAJ
Hall, William T. I.	KST
Hanley, Thomas J., Jr	MAJ
Hale, Henry T.	KST
Heffernan, Leo G.	MAJ
Hoffman, Edward L.	MAJ
Harmon, Hubert R.	MAJ
Hermans, Edwin F.	CJW
Holmes, Wayne Moore	Note 2

I

Isreal, Gerald H.	SLR; HHN
Irish, Harold E.	SLR

J

Jackson, Byron Edward	SLR
Jackson, Harland C.	SLR
Johnson, Byron T.	SLR
Johnston, Donald	TFT
Jamison, Howard L.	SLR
Jewitt, George D.	SLR
Junk, Fred Hampton	SLR; CAF
Jacobi, Godfrey L.	FLR
Jolly, James S.	FRF
Jones, Fred L.	TFT
Janda, George W.	SGS
Judge, Joseph B.	TFT
Jack, Butler, Jr.	SLR; LDT
Jackson, Perry Bibb	FLR; KST
Jaenke, William D.	SLR
Johnson, Clarence H.	SLR
Jones, Kirtley	SLR
Jones, Jay S., Jr.	SLR
Jordan, James J.	FRF; SLR
Junkin, James W.	SLR
Johnson, Bayard	SLR; WFO
Johnson, Harold McCorkle	SLR; KST
Johnston, John W.	SLR; KST (2)
Jacobi, George Nicholas, Jr.	SLR; KST (2)
Jones, Montgomery O.	SLR; WFO
Jeffries, Simeon C., Jr.	SLR; CRI
James, Louis T.	SLR
Jamison, Joy G.	SLR
Jacques, Stanley W.	FLR
Joy, Henry B.	Note 4
Jewett, George Daryl	SLR; LDT
Jamison, Howard Lacon	SLR; KST
Jones, Lloyd Bidwell	KST
Jernigan, Warren P.	MAJ
Johnson, Davenport	MAJ
Jones, Brevard McR.	SLR
Johnson, Elmo G.	GLC

K

Kent, George S.	SLR; WFO
Kiesewetter, Edward W.	WAC
Koons, Frederick L.	FLR
Kilburn, James B.	BST
Keeney, Charles Clarke	SLR; KST
Kritzer, Richard W.	SLR
Kelly, William B.	FLR
King, Royal W.	BST
Kelso, Fred Oliver	SLR; KST
Keyes, Nelson B.	SLR
Kelly, Fred W.	FRF
Kendall, Karl H.	SLR
Kemper, James Madison	SLR; KST
Koch, Alfred S.	CAF
Kesler, Leland White	SLR; SBI
Katzenberg, Herman S.	SLR
Kepler, Frank L.	SLR
Kuchins, Harry L.	SLR
Kingsley, Charles	SLR; DIK
Kane, John M.	SLR
Kanitz, Edward C.	SLR
Kavanaugh, Claude	SLR
Kahl, Charles Arnold	SLR; PMT
Kern, Frederick M.	SBI
Kirby, Kent S.	SLR; WFO
Kull, George C.	MSC
Kieran, Thomas, Jr.	ELA
King, Olon	SBI
Krapf, George W.	CRI; WCS
Krogstad, Arnold N.	CSO
Keesling, Lloyd N.	KST
Kennedy, Ardis M.	SLR
Kirkpatrick, James D., Jr.	SLR
Kendall, John D.	FRF
Krapf, George W.	MAJ
Kelleher, Marvin B.	GLC
Kirby, Maxwell	MAJ
Kales, William R.	CPR
Koster, Harold B.	SLR
Kendall, Earl Horatio	SLR; KST
Koehler, Herbert O.	FRF
Krogstad, Arnold N.	MAJ
Keyes, Nelson Beecher, Jr.	SLR; DIK

L

Lewis, Evan E.	DIS
Liebes, Arnold Lloyd	SLR; KST
Lipscomb, MacDonald E.	TFT
Lodge, Wellington H.	TFT
Lodewyck, Arthur George	SLR; BST
Lockwood, Manice DeF.	SLR
Lundeen, Arthur	SLR; SBI
Lauzon, Albert George	SLR
Lucas, Gilbert Loutrelle	SLR
Landes, Henry Browning	SLR; KST
Logan, Harold B.	KST
Lovell, Charles Phillip, Jr.	SLR; TFT
Lautz, Theodore V. V.	FRF
Lawyer, Samuel E.	FRF
Linder, John E.	SLR; DIK
Lanfall, John T.	FRF
Little, Frederick Eugene	SLR; CWT
Logan, Guy E.	REV
Lloyd, Lawrence A.	CAF
Lipscomb, William H.	SLR; CSO
Lawton, Bradley A.	FLR
Leek, John Bannister	SLR; KST (2)
Lee, John Curry	SLR; GLC
Lawrence, Rutherford	FLT; UTA
Lamber, Albert B.	CJW
Lesher, Carl Ray	SLR; KST (2)
Lowry, Hal M.	FRF
Leeds, Ralph J.	SLR
LeNoir, Victor A.	SLR
Leslie, Freeland H.	SLR
Lincoln, James S.	SLR
Lindley, Stacey B.	SLR
Lynn, William S.	SLR
Leffler, Clyde W. S.	PFO
Lindeman, Albion B.	SLR
Lee, John C.	FRF
Levisee, Rexford B.	ELA
Logan, Charles B.	KST
Logan, Henry J.	ELA
Leek, John B.	DIK
Land, Harry L.	FRF
Lesher, Carl R.	DIK
Lull, Linford C.	MSC
Land, Harry L.	SLR
Leighninger, Robert E. H.	SLR
Lindeburg, Alfred	SLR
Linder, John E.	SLR
Lovell, George E.	MAJ
Lee, Zanna P.	GLC

The Twin-Motored Handley-Page Bombing Machine, one of the most efficient machines of the allies. British Official Photo.

Lyon, Alfred J.	GLC
Lockwood, Manice DeForest	SLR; KST
Lyon, Edwin B.	MAJ
Loye, Donald P.	REL; Note 8

M

McCue, John B.	FRF
Markham, John A.	KST
Murphy, Eugene A.	CSO
Millikan, Charles E.	SLR
MacWilliams, Oliver	SLR
McIntosh, Lawrence W.	SMM; WCS
Montgomery, J. E.	TFT
Morrison, Walter Florian	SLR; CWT
Marshall, Willis Mitchell	SLR; KST
Mitchell, George Washington	SLR; KST
Mentzer, John Webster	SLR; KST
Moody, Corbitt Lidlie	SLR; KST
Mack, Walter Ray	SLR; KST
Mack, Donald L.	TFT
Merrick, Louis M.	TFT
Miller, Max B.	TFT
Morse, Charles L.	TFT
Munn, John C., Jr.	TFT
McMinn, Wiley W.	CAF
Meyen, Bert P.	CAF
Minges, Henry V.	CAF
Murphy, Maurice H.	CAF
McCaskill, Oscar W.	SLR
Mead, Frederick H.	SLR
Meyers, John N.	SLR
MacEnroe, John W.	FRF
Morehead, John L.	SLR; FRF; DIK
Mann, Alfred Campbell	SLR; CWT
Markham, Alfred Woodward	SLR
Moore, Samuel Murray, Jr.	SLR
Moore, William E.	FRF
Moore, Edward R.	FLR
Miller, Lyman R.	SLR
Miller, Leo E.	FRF
Mess, Robert W.	SLR
McDonald, Hunter	TFT
Murphy, John J.	KST
Martin, Frank E.	FLR
Mell, Patrick H.	FLR
McGovern, John Edward	SLR; LDT
Morgan, Stuart Alexander	SLR; KST (2)
McCoy, John F.	SLR
MacDougall, Kenneth	SLR
MacGowand, Kenneth A.	SLR
McKoy, Francis K.	SLR
McNulty, Dwight L.	SLR
Martin, David M., Jr.	SLR
Meldhal, Carl J.	SLR
Meraux, Jules C.	SLR
Metcalf, Manton B., Jr.	SLR
Moore, Rush I.	SLR
Morehead, John L.	SLR
Mulvihill, Mead J.	SLR
Marincik, Joseph A., Jr.	SLR
Martin, David J.	SLR
Mathews, John J.	SLR
May, Elmer N.	SLR
Meeker, Nathaniel H., Jr.	SLR
Meisenheimer, Floyd B.	SLR
Metcalf, Harry H.	SLR
Morehead, Joseph H.	SLR
Murphy, Cyrus W., Jr.	SLR
Murray, H. Sinclair	SLR
Moore, Kenneth L.	WBO
Myers, Maurice C.	FLR
Morris, Edward Savidge	SLR; LDT
Metcalf, Manton B.	FRF
Munson, Clinton Gardiner	SLR; EOT
Moore, Rush I.	FRF
Miller, Rolf T.	PFO
Martin, William C.	LHV
Metcalf, Thomas	PUP
Mayer, Henry	SLR; KST
McLean, Lucien L.	KST
Mullineaux, Lester R.	SLR; HHN
Miller, Bennie A.	FRF
Mills, Niles E.	FRF
McMahon, Philip J.	FRF
Maxwell, Maurice F.	PFO
Markle, Eckley B.	SMM
McConnell, Murray	SMM
Moore, John I.	SMM
Munro, Alexander H.	SMM
McKimmon, William S.	FRF
Meeker, Nathaniel H. J.	PFO
Malmgren, Carl E.	SLR; WFO
Martin, David M.	PFO
Marks, James C.	KST
Mason, Herbert M.	FLR
Malette, Frank L.	SLR
Miller, Wayne L.	SLR
Moss, Royal R.	SLR
Munson, Chester N.	SLR
Mann, Alfred C.	PFO
Meagher, Joseph E.	ELA
Marsh, Albert E.	DIK
Meyer, Rollin E.	FLR
Malone, Gilbert	SBI
Macrossie, William	FLR
McCoy, John F.	FRF
McClure, Ollie W.	KST
Maxwell, Maurice F.	SLR
Murphy, Francis E.	SLR
Myers, William B.	SLR
Marquette, John J.	KST
McDonald, Hunter	REV
Merrick, Marlowe M., Jr.	DIK
Miller, Walter	HHN
Marrs, Aubrey R.	HHN
Martin, Harold S.	MAJ
MacDonald, Andrew C.	SLR
Means, Gardner G.	HHN
Morris, David R.	FRF
Mead, Frederick Harold	SLR; KST
Millikan, Charles English	SLR; KST
Moore, Julian E.	FRF
McCaskill, Oscar William	SLR; KST
Meyers, John Nelson	SLR; KST
McNarney, Joseph T.	MAJ
Maynz, Theodore	GLC
McDonnell, John C.	MAJ
MacDill, Leslie	MAJ
Meredith, R. L.	KST
McRae, Nelson	KST
Merrell, Cyrus W.	Note 8
Mayo, Edward H.	REV; Note 6; WCS
Miller, Wyman Richardson	SLR; DIK

N

Nelson, Carl Edward	SLR; CGC
Night, William J.	FRF
Nolan, Thomas J.	FRF
Norton, Alwin W.	TFT
Nason, Roy Sewall	SLR
Nevin, John J.	ELA
Nabours, James O., Jr.	REV; CSO
Nelb, Alfred Walter	SLR; DIK
Nicholls, George A.	KST
Nimocks, Robert G.	SLR
Nourse, Roderick	SLR
Newman, Carl Emory	SLR; KST
Nelson, Guy W.	AAD
Naiden, Earl L.	MAJ
Netherwood, Douglas B.	MAJ
Neeley, Forrest H.	AAD

O

Organ, Vernon C.	CAF
Otis, Rolland Rice	SLR
Oates, Walter Alexander	SLR; TFT
Offutt, Magruder W., Jr.	TMA
Orlob, Rudolph	SLR; KST
Otis, Edward G.	SLR
Owens, Michael F.	TMA
Orr, Harry Barnes	SLR; KST
Osborne, Loyall A., Jr.	TFT
Olives, Robert S.	SLR; DIK
Oakes, Gail Clifford	SLR; KST
Owen, Maurice Clayton	SLR; LDT
O'Connor, Kenneth A.	CSO
Oakes, Gail C.	DIK
O'Neil, Joseph H.	KST
Olsen, Eugene F.	FRF
Otis, Edward Gardiner	SLR; KST
Oliver, Robert S.	SLR
Ort, Karl S.	SLR

P

Patterson, Robert A.	FRF
Pruter, Frederick	FRF
Palmer, Hugh	HHN
Peik, Paul G.	SLR; TMA
Perry, Merrill Graydon	SLR; TMA
Petrilli, John Michael	SLR; CWT
Plumb, Maril James	SLR; TFT
Paden, Robert Wellie	SLR; KST
Parsons, Charles	KST
Palmer, Elbridge	SLR
Penfield, Charles C.	SLR
Peterson, John Archie	SLR; TMA
Peterson, Percy Chester	SLR; CWT
Potter, Charles M.	CAF
Peddycoart, Clinton M.	FRF
Pyne, Herbert R.	TMA
Palmer, Claude N.	SLR
Payen, Owen S.	TFT
Payne, Amos O.	SLR
Patterson, Frank S.	TFT
Pierson, Sidney A.	SLR; DIK
Peterson, Percy C.	SLR; DIK
Peakes, Edward E.	FLR
Powell, Leon W.	FLR
Pegues, Johish J.	FLR
Pray, Thornton C.	CSO
Phillips, Robert Fletcher	SLR; KST (2)
Peck, Lott Mitchell	SLR; KST
Plettner, Walter E.	FRF
Parsons, Gustave A.	FRF
Potrilli, John M.	SLR; AAD
Pope, Harley H.	SMM
Plummer, Franklin Andrews	SLR
Pavesich, Francis X.	SLR; WFO
Pyne, Meredith H.	SBI
Pike, Glenn M.	FLR
Phillips, Robert F.	PFO
Parrish, Albert E.	FLR
Pease, Karl	SLR
Pelot, Marion E.	SLR
Portner, Louis J.	SLR
Phillips, Donald B.	FRF
Paulson, Carl F.	SLR
Perry, Pierce R.	SLR
Potts, John T.	SLR
Prigmore, Raymond H.	FRF
Penfield, Charles Carlisle	SLR; LDT
Peebles, William B.	MAJ
Powel, Hartford W. H.	BST
Palmer, Claude Nelson	SLR; KST
Patterson, Robert E.	SLR
Page, Frank A.	SLR
Phillips, Donald B.	SLR
Pardee, Charles M.	KST
Parker, Roy C.	GLC
Purcell, William L.	GLC
Patterson, Stuart R.	SLR
Pierson, Sidney A.	SLR
Pulsifer, George, Jr.	MAJ
Peek, Norman W.	MAJ
Palmer, Elbridge	SLR; DIK

Q

Quinlan, John Humphrey	SLR; KST

R

Robinson, Clarence C.	FRF
Roy, Donald M.	FRF
Rinehart, John B. G.	SLR; TMA
Rockstroh, Frederick Charles	SLR; TMA
Rogers, Gardiner Merriman	SLR; CUI
Reddington, William Francis	SLR; KST
Robinson, Bernard Buckley	SLR; TMA
Richardson, Ernest L.	MSC
Rosson, Joseph R.	FRF
Roullot, John P.	FRF
Riley, Sidney Alfred, Jr.	SLR; CWT
Rogers, Lee Hugh	SLR; CWT
Rochester, Thomas Fortescue	SLR; TFT
Reade, George W.	BST
Robinson, Malcolm Graeme	SLR; CWT
Reber, Alvin D.	TMA
Rollins, Richard	TFT
Roth, Archie F.	FRF
Reed, William J.	SLR
Rice, Robert H.	SLR
Rowe, Samuel D.	SLR
Rowe, John Albert	SLR; RWT

The cockpits and motor placement of a German Albatros. French Official Photo.

ON MOMENTS OF INERTIA*

By T. H. JONES, B. Sc., A. M. I. M. E.

AN accurate knowledge of the methods of finding the moment of inertia is of very great importance to the designer and stress-draughtsman in almost any branch of engineering, and this is particularly so in a few of the more modern branches where maximum strength must be consistent with minimum weight. In many of the easier and regular shapes of sections the moment of inertia (I) can be readily found by calculation which ensures a good degree of accuracy; but quite a large number of shapes of sections in common use are such that for accuracy the methods of calculation would not be practicable. For these different sections I is usually found graphically, and almost any text-book will provide some method of doing the work; but the methods generally suggested, however, are often difficult to use and liable to inaccuracy. The following method is about the best, and it can be recommended for its simplicity and general reliability. To find the I of any section, draw out the section, then cube all the ordinates with the neutral axis as base. Complete the figure formed by these ordinates, and find the area enclosed by the curve so drawn. One-third of this area = I of this section.

I BEAM SECTION.

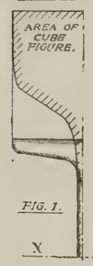


FIG. 1.

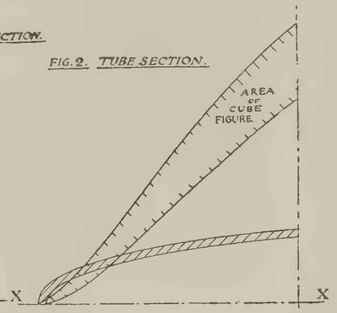


FIG. 2. TUBE SECTION.

Very often the section has to be drawn to some scale, and this must be accounted for in the estimate of I.

As an example, take a 5-in. × 3-in. I beam section the linear dimensions of which were drawn full size. (Fig. 1.) Since the section is exactly symmetrical only a quarter need be drawn. By means of a table of cubes found in most pocket books the lengths of the ordinates from the neutral axis are cubed, and for convenience are set out one-third size, the cube figure being distinguished by the open shading.

To Find the I of the Whole Section of the Beam

We find the area of this cube figure by means of a planimeter to be 3.4 sq. ins. Now the cube scale is one-third (Linear Scale:—full size), therefore I of whole section about XX is given by:—

$$\frac{3.4 \times 4}{3} = 13.61 \text{ (ins.)}^4,$$

which corresponds to the figure given in the particular pocket book of standard sections for this size of section, *i.e.*, 5 ins. × 3 ins.

As a further example, take an oval-shaped tube. (Fig. 2.)

This was drawn 4 × actual size, but because of symmetry again only one-quarter was drawn.

The cube figure was drawn in the usual way, *i.e.*, the *actual* ordinates are cubed and then drawn to scale 100 times full size for convenience. The area of the cube figure for the *whole* section = 5.59 × 4.

Now linear scale = 4. Cubes scale = 100.

∴ I of whole section about axis XX

$$= \frac{5.59 \times 4}{3 \times 100 \times 4} = .01863 \text{ (in.)}^4.$$

If the section be not symmetrical then the C.G. must be found, through which the neutral axis is then drawn and the cube figure constructed in two separate portions, the one above the axis and the other below it.

This method can be used for any shape of section, to find the I about any axis of bending; it is quick and accurate, simple and straightforward, and is certainly not so well known as its usefulness would warrant.

For circular sections of rods, tubes, etc., the I of the sections is easily calculated from the ordinary rule:—$I = \frac{\pi}{64}(D^4 - d^4)$, where D = outer, and d = inner, diameters respectively. Many pocket books give a list of values of I for circular sections which is undoubtedly of much use.

The usefulness of such a table is, however, considerably lessened when the gauge of a tube, say, is such that the inner diameter becomes an odd size, although the outer diameter may be quite an even figure. To overcome this difficulty and to save time in geting out the values of I for such sections, the accompanying graph (Fig. 3) has been made, showing values of I of circles of diameter .2 in. up to diameter 2.0 ins. They are plotted in such a way that a good degree of accuracy may be obtained by mere inspection of the graph. It will be seen that the scale of I is not constant, and consequently the values of I are written on the curves themselves, but the curves themselves are all successively continuous. As an example of one of the many uses of such a graph, take the case of a metal tube having an outside diameter of .875 in., and gauge thickness = 20 = .036 in.

Therefore inside diameter = .803 in.

From the graph the I corresponding to a diameter .875 in. = .02876, and I corresponding to diameter .803 in. = .02038.

Hence nett I of tube = .02876 — .02038 — .00838 being the difference.

Conversely knowing the value of I for a tube, which will suit the particular job in hand, then the diameter and gauge can easily and quickly be found by reference to the graph.

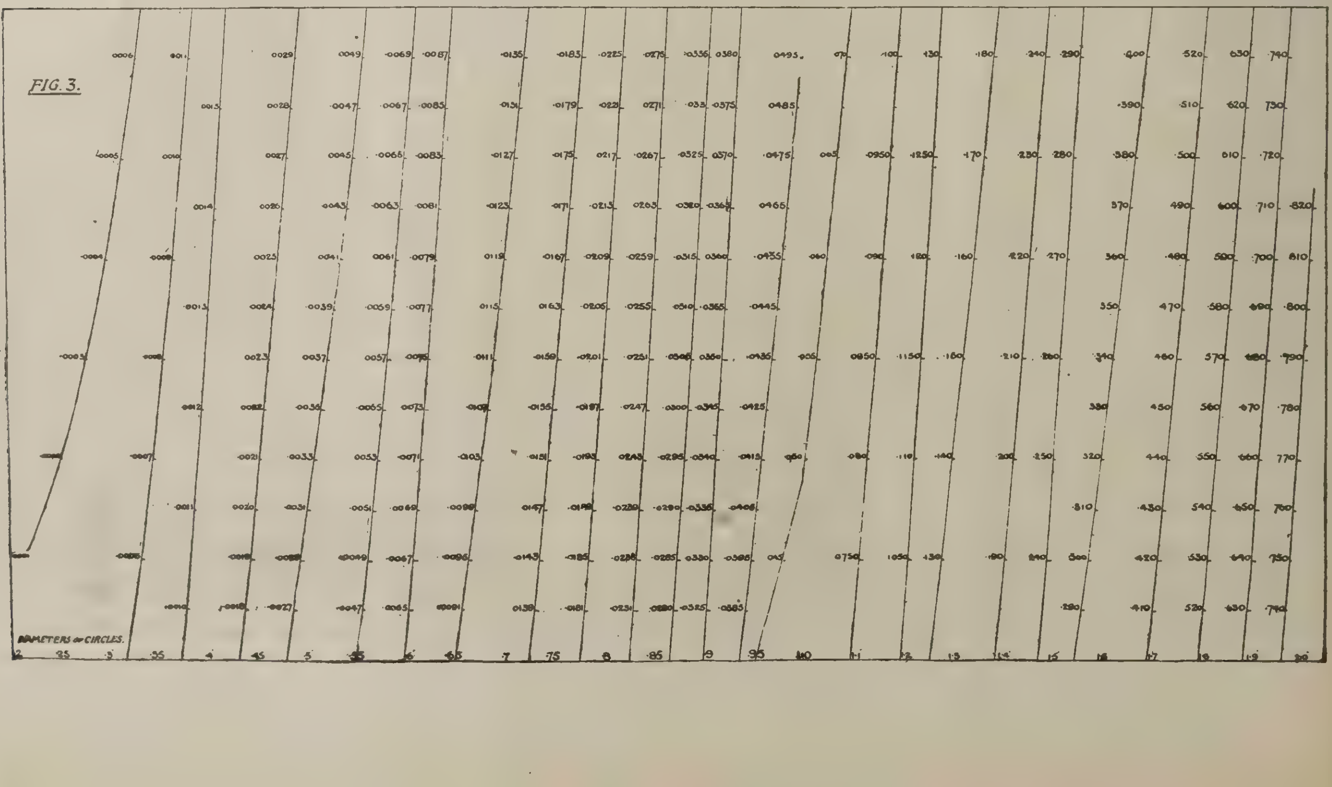
If the polar moment of inertia of any circular section be required, this is equal to twice the I about a diameter.

The usefulness of such a graph like the one illustrated in Fig. 3 is considerable, but for those who would prefer to interpolate, the tabulated values of I are here given, together with the corresponding diameters.

This system of graphing has wide application where accurate readings are required by mere inspection and it is for the readers themselves to apply the method to their own particular needs.

Diam. of Circle. Ins.	Values of I.	Diam. of Circle Ins.	Values of I.
.150	.0000248	.925	.035910
.200	.0000785	.950	.039960
.225	.0001258	.975	.044340
.250	.0001918	1.000	.049090
.275	.0002807	1.025	.054160
.300	.0003976	1.040	.057420
.310	.0004533	1.075	.065580
.325	.0005475	1.100	.071780
.335	.0006182	1.130	.080040
.350	.0007365	1.160	.088880
.365	.0008711	1.200	.101780
.375	.0009701	1.230	.112360
.385	.001079	1.250	.119830
.400	.001256	1.270	.127690
.410	.001387	1.30	.14019
.425	.001601	1.32	.14902
.430	.001678	1.35	.16304
.450	.002013	1.37	.17291
.460	.002198	1.40	.18890
.475	.002498	1.42	.19959
.480	.002606	1.45	.21698
.500	.003068	1.48	.23550
.510	.003321	1.50	.24849
.525	.003729	1.52	.26200
.530	.003874	1.55	.28332
.550	.004487	1.57	.29824
.560	.004828	1.600	.32169
.575	.005358	1.625	.34310
.580	.005558	1.650	.36382
.600	.006362	1.670	.38181
.610	.006796	1.700	.40998
.625	.007489	1.720	.42962
.635	.007981	1.750	.46040
.650	.008754	1.780	.49277
.675	.010190	1.800	.51523
.700	.011790	1.820	.53857
.725	.013550	1.850	.57496
.750	.015570	1.875	.60670
.775	.017700	1.900	.63987
.800	.020100	1.920	.66697
.825	.022740	1.950	.70988
.850	.025610	1.970	.73929
.875	.028760	2.000	.78540
.900	.032180	2.020	.81726

FIG. 3.



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* Courtesy of *Flight*, London.

THE ARTIFICIAL SEASONING OF WOOD

By Professor PERCY GROOM, D.Sc., F.L.S.*

THE seasoning of timber is in essence a post-mortem process of drying conducted in such a manner as to permit of the wood being used as a structural material. It is necessary to emphasize the fact that the process is one conducted after the normal vital activity of the tree has been arrested, because it has been seriously but entirely erroneously urged in the courts of law that the term "mature" as applied to timber is a synonym of "seasoned."

In order to devise perfect methods and apparatus for artificially seasoning timber, it is necessary to understand the physical principles determining the drying of any material and the practical application of these to ensure equable distribution of heat and moisture among the drying objects. But it is also necessary to have full knowledge of the structure and properties of wood, as well as the effects induced in these properties induced by change in the amount of water contained in the wood.

Construction of Wood

Wood is not a material; it is a structure, and varies in design and construction not only in the different kinds of timbers, but also in wood produced by one and the same species of tree. It is essentially composed of a material, allied to cellulose, that may be termed *wood-substance*, which is excavated into countless minute closed cavities of various shapes.

The structural constituents of wood thus are all hollow and shaped like narrow spindles, tubes, or bricks; their solid parts, composed of wood-substance, are termed "walls." Those constituents mainly dovetail with one another and their long axes are mostly parallel to the original long axis of the trunk or branch of the tree. But this main grain of the timber is crossed at right angles by bands of weak brick-shaped constituents; as these bands in the original trunk run transversely in a radial direction, they are termed "rays." Such rays are familiar as the cause of the silver grain of oak, beech, mahogany, and other woods.

These various structural constitutents may contain in their cavities air, water, and substances dissolved in water, small quantities of various solids and occasionally resin, which is often contained in special local spaces created by the local separation of the structural constitutents. The solid walls contain water and relatively small amounts of various complex organic substances.

From the present standpoint a piece of wood may be regarded as being composed solely of wood-substance, water, and air, for the other substances present represent only an insignificant fraction of the weight of the whole.

Water in the Green (Fresh) Wood

In the trunk of a sufficiently mature standing tree a considerable amount of water is contained in the outer wood (*sapwood*) and usually a smaller amount in the central wood (which, when differing in color from the outer wood, is termed *heartwood*). For instance, in the Scots pine (red deal) the sapwood is on the average about four times as moist as the heartwood. In other cases (*e. g.*, the oak) at times the sapwood and heartwood may contain almost equal amounts of water.

The Drying of Wood

The water present in the cavities (as opposed to the walls) can pass freely along the cavities and through the walls, so that when wood is dried this water readily evaporates, and a piece of wood containing more than 100 per cent (the percentage of water is best expressed as a percentage of the weight of the absolutely dry wood in which it was originally contained) of water is easily dried to a condition when the water is solely in the walls, and amounts to 25 to 30 per cent. Yet during the phase of drying, if the wood is being artificially seasoned at a high temperature, two opposite effects and defects may be induced so that ruptures arise in the wood. On the one hand, the rapid production of steam inside the closed hollow constituents creates pressure that suffice to burst the little chambers open and cause large splits in the timber. On the other hand, the drying timber may collapse along its grain; this collapse may be due to the evaporation of water from the hollow closed constituent being accompanied by little or no admission of air, until a thin film of moisture remains lining the wall; this film, by its contraction due to surface tension, exerts on the wall a pull that culminates in collapse.

After the evaporation of the water contained in the cavities of the remaining water is held with considerable force by the wood substance (walls), which therefore may be loosely described as being a hygroscopic material. Wood-substance, like a number of other organic materials (glue, gels, and so forth), shrinks when it loses water, and swells when it absorbs water. Thus, at least in very thin drying pieces, wood does not begin to shring until it contains 25-30 per cent of water, and if it were possible to regulate the loss of water from a drying piece of timber so that the evaporation was balanced by an equal flow of water from the interior, no shrinkage would take place until all the water in the cavities has been removed. Indeed, in the cases of many timbers no perceptible shrinkage takes place during the early phases of seasoning; when once the cavities have been depleted of water shrinkage begins, and is henceforth proportional to the amount of water lost.

Assuming that a piece of wood, not too thick, has reached this critical point and is exposed to the atmosphere at normal temperatures, it will continue to give off water vapor until the water in the wood-substance (at any rate at the surface) is in equilibrium with the atmospheric moisture. This stage is reached, in our country, in the open air, but under cover when 17-22 per cent of the moisture is present. When brought into drier outhouses the wood becomes more fully seasoned and its humidity sinks to 13-17 per cent, while after being kept in rooms at least intermittently warmed, it attains a degree of dryness at which only 10-13 per cent of water is present. But in none of these cases is a final permanent degree of humidity attained; increase and decrease in the relative humidity of the atmosphere cause the wood respectively to absorb and emit water. It is partly to avoid such changes in the water-contents of wood, and the consequent changes of shape and size, that wooden articles are frequently coated with more or less impervious layers of varnish, paint, oil, paraffin wax, and so forth.

These various percentages of moisture therefore indicate the degrees of humidity to be aimed at in the artificial seasoning for articles that are to be used in the corresponding situations. Such is the usual *rationale* of the condition attained by naturally seasoned wood. There are, however, considerable qualifications to be added. On the other hand, it is known that in houses massive beams of oak, hundreds of years old, have been found to contain much moisture at the centre; it is also known that articles of oak, however well seasoned, when their surfaces are replaned "mover" and may crack at the surface. Those facts suggest that at least certain kinds of wood tend to acquire a relatively impervious surface, and that the inner wood in thick pieces of timber always contains a larger amount of water than corresponds to equilibrium with the local atmosphere.

Shrinkage and Warping of Wood

The shrinkage or swelling of wood-substances (walls of the constituents) occasions corresponding changes in dimensions of a piece of wood. These changes in dimensions are not equal in different directions, and therefore tend to be accompanied by changes of shape of the piece of wood. The cause of this lies in the hetrogenous structure of the latter. The elongation of the constituents along the grain causes a distinction between the transverse and longitudinal structure. The occurrence of the rays, and the concentric construction of the successive layers of wood, evoke differences in circumferential and radial structure. Shrinkage and swelling are unequal in all these cardinal directions; along the grain (longitudinally), and transversely in the radial and circumferential ("tangential") directions.

The fibres and other structural constituents of wood, like vegetable films in general, shrink and swell much less along their long axes than transversely. In drying from the green to the fully-seasoned conditions, wooden rods cut along the grain, transverse-radially, transverse-tangentially, usually show respectively the following shrinkages recorded in percentages of the original length 1, 3-5, and 6-10. The greatest cause of warping and splitting during drying is the disproportionately large circumferential (tangential) shrinkage when compared with radial shrinkage.

If we consider the seasoning of the trunk of a tree, it might appear impossible to secure this without the wood splitting, since the circumference tends to shring twice as much for each end of length as does the resin. But wood is both extensible and plastic, so that a beam loaded at the centre acquires a permanent set; hence it is possible to season wood without distortion or splitting, despite the tendency towards differential contraction.

If a piece of wood be dried too rapidly, so that the outer layers tend to shrink too quickly when compared with the inner wood, one of the following results ensue: either the piece warps or splits at the surface, or it undergoes a change known as case hardening, or there is a combination of these effects.

Case Hardening

Case hardening is almost universal in wood that has been seasoned too rapidly in a drying kiln. The name is appropriate, because where these defects exist the wood at and near the surface is different from that lying within, and, so to speak, forms around this a hard case. The wood is harder than if properly seasoned. It may or may not display superficial cracks or internal cavities that are pointed-oval in a section across the grain of the wood. When such wood that has been fully dried throughout is planed along one face, it bends, becoming concave on the newly exposed surface, or if it be sawn through the middle, the two halves bend so that the fresh surfaces are concave. If, however, the hard case possesses well-developed cracks these curvatures do not take place. The *rationale* of these phenomena is as follows:—During rapid drying the superficial wood dries more rapidly than the water is supplied to it from within. It therefore tends to shrink, but its contraction is opposed by the internal wood, which has not lost sufficient moisture to cause it to shrink at the same place (if at all). The inner wood, therefore, is in a condition of compression, while the outer wood is in tension. The latter being ductile resists rupture but acquires a permanent set. The hard case of wood thus formed opposes the outward passage of water, so that the internal wood dries more slowly and accordingly tends to shrink more. Eventually a stage is reached when the inner wood has lost so much water that it tends to contract more than did the outer wood, so that the conditions of stress are now reversed, the outer wood being in compression and the inner in tension. As a consequence at this phase internal splits may arise, and widen out to form the oval "honeycomb" cavities already mentioned. Wood completely dried continues to retain this peculiar stressed condition (excepting in so far as it is relieved by splits), and therefore bends *instantly* as it leaves the saw or planing instrument. Such bending differs from warping, which is caused by lack of uniformity in the distribution of moisture at the time of bending, and is the gradual result of differential tension caused by subsequent drying. A succession of the two kinds of bending takes place if a piece of wood in the first stage of case hardening be sawn through; for the newly exposed inner damp wood, liberated from its condition of compression, elongates, whereas the hard "case" remains constant in dimensions, with the consequence that the freshly exposed surface becomes convex. But as the wood dries the convexity changes to straightness, and finally to concavity as the damp wood dries. During the initial stages of case hardening, shallow cracks may arise in the outer hardening wood and partially relieve the tension. Such cracks may be subsequently closed in the second stage, when the hard case is in a condition of compression.

Warping and Splitting

The elementary facts in relation to the different amounts of shrinkage in the three cardinal directions fully explain such phenomena as the lack of warping in quartered or rift-sawn wood, the excessive warping or splitting of wood with curved grain (including burr wood), and partly justify the use of three-ply wood. Yet there remains many problems requiring solution as to the proneness of certain kind of timbers to warp or split, and to the causes determining whether a wood shall merely warp or merely split or display both these defects.

Mention may now be made of a special additional case illustrating the effect of the mode of cutting timber in determining whether or not the latter will be successfully kiln-dried. In certain types of exotic timbers the grain, in place of being straight, runs in successive layers alternately in right-handed and left-handed spirals, with the result that in a bastard-cut board the grain is not only oblique, but also appears to be interlocked. Such wood is truly cross-grained. A bastard-sawn board, when rapidly dried, is apt to twist, because longitudinal shrinkage on each face is least along the direction of the prevailing grain. When the effects on the two faces of the board agree in sense, a twisting couple is established. The prevention of this lies in cutting the trunk radially into boards—*i.e.*, producing solely quarter-sawn boards.

Amount of Shrinkage

Under like conditions the shrinkage (or swelling) of different kinds of timbers, of different samples of the same timber, or even of the various constituents of one piece of timber, is not the same. Taking the last case first, certain softwoods (coniferous timbers), when properly kiln-dried, or when installed in an incompletely seasoned condition as panels, become ribbed along the grain. The ridges and furrows correspond to alternating layers of light spring wood and heavy summer-wood, which have shrunk unequally.

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* Paper read before the Institute of Automobile Engineers

It is often alleged that heavy woods shrink more than do light ones. This statement, though not devoid of some foundation, is often opposed to the truth. But to understand the matter fully it is necessary to consider the precise significance of the terms "heavy" and "light" as applied to woods.

Wood-substance composing the solid framework of all timbers is, within very small limits of variation, invariable in specific gravity (.56), being slightly more than half as heavy again as water. Hence, in comparing two pieces of wood of equal volumes and deprived of all water, the one is heavier than the other (almost) solely because it contains more wood-substance and less air. Consequently, when two pieces of wood of different (apparent) specific gravity, but containing the same percentage of water, are being seasoned, the amount of water lost during drying down to the same percentage of humidity is proportional to the apparent specific gravities of the two woods when absolutely dry. Thus for this reason alone a heavy wood seasons more slowly than a light wood under identical circumstances. Obviously, also, if a heavy wood and a light wood are first deprived of all the water in their cavities, subsequently the comparative amounts of shrinkage of the wood-substance of the two will be proportionate to their (dry) specific gravities, assuming that they ultimately contain the same percentage of water. This might cause us to anticipate that a heavy timber would shrink more than a light one. Moreover, it has been found that specimens of wood rapidly dried in an oven at a high temperature shrink less than specimens of the same kind of wood that are dried more slowly. This fact (which as a generalization requires confirmation) might lead us to anticipate that the slowly drying heavy timber would shrink more than the more rapidly drying light one. But these anticipations leave out of count the fact that the minute architecture of different timbers varies widely. Thus the generalization in reference to the great shrinkage of heavier woods is not true. It is, however, the fact that the lighter softwoods season more rapidly and shrink less than the heavier hardwoods. Moreover, the shrinkage of different samples of the same kind of wood, and to some extent of different kinds of timber that are structurally very similar, is often proportional to the apparent specific gravity. The lightweighted wood of Weymouth pine (Canadian white or yellow pine) shrinks less than the heavier Scots or Baltic pine (red deal); in this case probably also because the former is richer in rosin, which decreases shrinkage.

The preceding remarks at least partially explain why softwoods (coniferous timbers) are more easily and rapidly seasoned than are hardwoods, without inducing distortion and cracking, and why the seasoning can be conducted safely at higher temperatures in the case of the former timbers.

The structure of softwoods is relatively simple, for the timber is mainly composed of spindle-shaped fibres, which differ among themselves almost solely in that the spring-wood fibres have wider cavities and thinner walls than have those of the summer-wood. Moreover, the rays crossing these fibres at right angles are extremely thin, and consequently disturb the straight course of the fibres to a minimum extent.

Hardwoods, on the other hand, are complex in structure, and consist of various structural constituents that vary greatly in shape, width and thickness of wall. These include long thin-walled relatively wide tubes, varied fibres, and very short, often thin-walled brick-shaped constituents. Crossing these are the rays, which may be so thick (*e.g.*, in oak) as to necessitate the curving of the grain round their flanks.

Objects and Effects of Seasoning

The objects and effects of seasoning wood are:

1. To decrease its weight.
2. To decrease its shrinkage, warping, and splitting when the wod is utilized for its final purpose.
3. To increase its strength (especially in compression), its limit and its co-efficient of elasticity, and its hardness (when measured by indentation).
4. To decrease its pliability and toughness both below and above the limit of elasticity.
5. To increase the power of resistance of the wood to decay.

A piece of timber by its loss of water during seasoning may lose more than 50 per cent of its original weight, and may gain 100 or over 200 per cent in strength. But when the seasoning process is carried far, however carefully this be done, wood tends towards brittleness. On the other hand, if one wishes to increase the pliability and plasticity of wood one heats and moistens it, so that prolonged treatment with steam renders wood very pliable and plastic, and thus tends permanently to rob it of a portion of its elasticity. The significance of these facts will be evident when the different processes of artificial seasoning are considered.

Natural and Artificial Seasoning

In *natural seasoning* the sun's rays constitute the source of heat, and natural atmospheric currents contribute to the drying process. In correspondence with the variation in climate and weather, the process is irregular and unregulated, sometimes being in abeyance and at some other times being too rapid. The timber is consequently liable to warp and split, to undergo decay, or to be attacked by boring insects. Yet natural seasoning, despite of its wastefulness and long duration, has one advantage: it yields wood mechanically superior to wood that is artificially seasoned by any but the best processes.

Artificial seasoning usually takes the form of *kiln-drying,* in which the source of heat is artificially induced currents of air of regulated humidity. When properly carried out it saves not only time but also material, and may yield wood perfectly suited for its ultimate purposes. In the past, however, artificial seasoning has been mainly applied to wood destined for use in furniture and other objects, in which standing qualities were the main feature aimed at, and in which mechanical defects, such as brittleness, were not of paramount importance. It may be stated now that although artificial seasoning has been so successfully applied to certain kinds of timber that there is no evidence of any inferiority to naturally seasoned wood, much research and experiments will be required before we know how to accomplish this in the most safe and efficient manner in connection with other timbers.

Artificial Seasoning—Four means of regulating the evaporation of water from timber are available for use:

1. Supply of artificial heat.
2. Production of air currents.
3. Regulation of the humidity of the air.
4. Regulation of the pressure of the air (rarefaction).

Excesses in any of these is liable to cause the wood to be damaged or to delay the seasoning.

Early in the history of mankind the seasoning effect of *artificial heat* must have been discovered, for green sticks held in front of a fire become hard and strong, while various articles made in primitive fashion in the forest of freshly-felled beech are even in modern times hardened by holding them in the fumes rising from burning wood.

From such primitive beginnings there is but a slight step to the earliest types of *drying kilns,* in which the timber was contained in a room, at one end of which was a furnace that was separated from the timber only by a screen; or the room possessed a perforated floor below which was a furnace burning sawdust, shavings and fragments of wood. Obviously in such cases, although ventilating chimneys were provided, uniform distribution of heat and uniform drying were impossible, and the wood near the source of heat dried too quickly and was largely spoilt.

Relatively ineffective was the mere placing of the heating arrangements outside the drying chamber, for again the timber packed towards the centre dried more slowly than that outside.

Stewing or Prolonged Steaming of Wood

Before passing to the more modern types of seasoning kilns mention may be made of another process of dealing with green wood by means of heated water-vapour with no ventilation. The pieces of wood are piled directly on one another in a chamber that can be hermetically closed. After closing the chamber hot water-vapour, at a temperature above 30° C., is admitted from numerous holes in a tube. This vapour penetrates the wood, condenses, and causes an outflow of colored sap, which sinks into the concave floor of the chamber. When the requisite pressure has been attained the steam pipes are closed for four or five hours. Thereafter the colored thick brown sap is evacuated through an outflow pipe. The process is repeated until the sap flowing out and condensing is colorless; this stage being reached in four to five days. The door and escape shaft are opened to admit a free current of air and to allow the wood to cool. Thereafter the wood is transferred to a drying kiln or allowed to dry for a longer time at normal temperatures. The wood thus treated is seasoned in about four to five months instead of the two or three years that would be required for natural seasoning. Its properties are changed: sometimes its color is clearly modified, it is easier to work, warps less, and is said to possess increased powers of resisting, not only decay, but also attacks by insects. The treatment is akin to the prolonged steaming process by which beech wood is so changed that it loses its natural tendency to warp and split and acquires such redness of color as to facilitate its use as a substitute for mahogany.

Such processes of steaming are quite different from, and more prolonged than, those employed in rendering possible the permanent bending of beech and ash, or permanent compression of oak for railway keys.

The change in color that may take place in drastically steamed woods is thus accompanied by change in the properties of wood. These easily detected modifications are at least often paralled by changes in the chemical composition of the steamed wood. Mere boiling water relatively soon breaks down wood-substance partially and causes the production of cellulose (cj. cotton wool), and hot steam occasions the same chemical degradation.

Thus, in considering the possible effect of steaming processes freely employed in certain drying kilns, it has to be remembered that steaming tends to soften wood, renders it temporarily pliable, and so robs it of its elasticity as to make it into a plastic material.

Mechanical Effects of Different Methods of Heating Timbers

Having considered the more obvious effects of the application of dry heat and of steam on wood, it is possible to view in greater detail some results obtained in experiments performed under the auspices of the Forestry Service of the United States on woods to which heat and moisture were applied in various ways. The accompanying table gives some of the results obtained:

In the columns headed "Compression" and "Bending" are given the percentage changes in strength when compared with the wood naturally seasoned to the same degree of humidity: (*a*) denotes a gain in strength; (*b*) a loss; (*c*) no change. The columns headed "dry" refer to wood which was first naturally seasoned, then in this condition was subjected to the particular treatment indicated, and thereafter finally naturally seasoned for one year, and finally tested. The columns headed "Soaked" refer to wood which was naturally seasoned, then soaked with water, and in this wet condition was subjected

Nature of Treatment	White Ash						Loblolly Pine		
	Temperature, Fahr.	Duration of Treatment	Compression, Dry	Compression, Soaked	Bending, Dry	Bending, Soaked	Duration of Treatment	Compression, Dry	Bending, Dry
Dry air	145	25 days	(*c*)	(*c*)	(*c*)	(*a*)5	26 days	(*c*)	(*b*) 2
Dry air	170	—	—	—	—	—	8 days*	—	(*b*) 6
Dry air	200	—	—	—	—	—	3 days*	(*c*)	(*b*) 5
Dry air	250	—	—	—	—	—	6 hours*	(*c*)	—
Saturated steam	212	1 hour	(*c*)	(*c*)	—	—	1 hour	(*c*)	—
Saturated steam	212	4 hours	(*c*)	(*c*)	(*c*)	(*b*)2	4 hours	(*c*)	(*c*)
Saturated steam, 90 lb	331	1 hour	(*b*) 27	(*c*)	—	—	15 min.	(*b*) 9	—
Saturated steam, 90 lb	331	5 min.	(*b*) 4	(*c*)	(*b*) 3	(*c*)	4 hours	(*b*) 42	—
Saturated steam, 30 lb	274	—	—	—	—	—	4 hours	(*b*) 11	(*b*) 10
Exhaust steam	145	19 days	(*c*)	(*c*)	(*c*)	(*c*)	22 days	(*c*)	(*c*)
Exhaust steam	145 }	—	—	—	—	—	22 days }	(*b*) 2	—
Exhaust steam	170 }						2 days }		
Superheated steam at atmospheric pressure	274	—	—	—	—	—	4 hours	(*c*)	(*c*)
Superheated steam at atmospheric pressure	331	6 hours	(*c*)	(*b*) 3	—	—	—	—	—
Superheated steam at 30 lb. pressure	298	—	—	—	—	—	4 hours	(*b*) 8	—

*Plus 26 day at 145° Fahr.

to the treatment indicated, and subsequently tested after a year's natural seasoning.

The results of these tests may be summarized as follows:

Exposure to a temperature of 145° F., with dry air or exhaust steam, for nineteen to twenty-six days had little effect on the compressive or bending strength of the two timbers. An additional couple of days in exhause steam or an additional eight days of dry heat at 170° F. evoked signs of weakening.

Shorter exposures to saturated steam at 212° F. (for up to four hours) or superheated steam at atmospheric pressure at temperatures 274° F. and 331° F. (for four and six hours respectively) caused no injurious effects.

But immediately that saturated or superheated steam at high temperatures, with the pressure at 30 lbs. or more, is applied, weakening of the timbers quickly ensued. In saturated steam at 274° F. at a pressure of 30 lbs., pine was in four hours weakened about 10 per cent; at 331° F. and 90 lbs. pressure, ash was in five minutes weakened 4 per cent, and in one hour 27 per cent; while the pine was weakened 9 per cent in fifteen minutes and 42 per cent in four hours.

But when the ash was subjected in its soaked condition to saturated steam at 331° F. with the pressure at 90 lbs., no ill effects resulted; yet under the desiccating influence of superheated steam at the same temperature, but at atmospheric pressure, a weakening took place.

The significance of these results, particularly in relation to speeding up of artificial seasoning processes, is obvious, but is of limited scope, since these tests were merely static and gave no indication as to the shock-resisting powers of the treated woods. Tiemann, however, in giving an account of this research, states that the woods subjected to the high temperatures were more brittle than naturally seasoned.

Another effect of most of the treatments recorded in the table was that the woods treated subsequently showed reduced warping and shrinkage when compared with naturally seasoned wood. An abnormal darkening of the color of the wood was evident, especially when high temperatures were used.

Before passing away from the consideration of the effect of damp air upon wood, it may be mentioned that when the air is damp but merely warm, not only is the desiccating action low or non-existent, but the conditions favor the growth on the wood of moulds and more virulent wood-destroying fungi. And there are on record cases in which seasoning timber or the woodwork of kilns have been damaged through this cause.

It is now obvious that each kind of timber must be treated in a special manner, and that the precise seasoning treatment of one and the same kind of timber will vary with the dimensions of the pieces to be seasoned and with the amount of water that they contain. Moreover, one piece of wood may consist partly of sapwood and partly of heartwood, and the latter will dry more slowly than the former. Moreover, no two planks from one tree contain the same percentage of water, and a single plank may show considerable inequalities of moisture along its length and always does show such inequalities at different distances from the surface.

Considerable amount of experiment and research will have to be undertaken before the practical solution of these difficulties is accomplished for various kinds of woods.

It is, however, evident that in a kiln it is necessary to ensure approximately equal heating of all the pieces of wood and equable removal of water from them. These aims are best accomplished by the supply of hot air that shall be freely supplied to all points of each piece of wood. Two methods widely differing in design are in use:

1. In one the timber is ranged in layers tier upon tier, each being separated by a short distance from a corresponding layer of steam-heated pipes. Here the air is heated inside the kiln.
2. In other types hot air is admitted to the kiln from the floor or walls or from the end. Most of the modern kilns belong to this type and may be ranged into two sub-types:
   - (*a*) The chamber or compartment type
   - (*b*) The progressive or tunnel type.

The chamber type is illustrated by the *Sturtevant Kiln*, which in its completest form has three main air-distributing ducts, supplying respectively warm dry, cold dry, and moist air. Branch ducts from each of these connect with each department or chamber, if there be more than one of these; the supply of air is regulated by dampers. The process of drying is as follows:

1. Admission of moist cool air
2. Maintenance of humidity while the temperature is raised
3. Decrease in the relative humidity of the air and further rise of temperature

Circulation of the air is secured by fans, one of which takes fresh air, a part of which passes into the cold air ducts, and the rest passing through the heater and thence to the hot air duct. Another fan takes moist air from the chamber containing the wood and conveys any required amount of it to the moist air duct. Additional moisture may be liberated in the drying chamber by means of sprays.

Kilns of the compartment or chamber type are well fitted for simultaneously seasoning pieces of wood of various dimensions and even of different kinds. It is simple also to use in them autographic recorders of the temperature and humidity, so that model charts can be constructed to serve as guides for future operations. One other advantage is that the air currents are under control in all weathers and at all seasons.

In the tunnel type of kiln the timber is placed on trolleys and is moved forward along the tunnel day by day in the face of a current of air that meets it. This current of air is driest as it enters, and gains in moisture as it passes over the seasoning wood, and, therefore, moistened as it leaves the tunnel at the other end, where each batch of timber enters. In the modern Erith progressive dryer the air entering near the discharge end comes from below and descends at the end at which the timber is admitted, so that the circulation of air is rotary; a shaft permits the exit of excess of moist air. This system is especially valuable where large quantities of the same kind of timber of equal dimensions have to be seasoned.

The temperatures used vary from 70° F. up to nearly 232° F., according to different customs, and according to the purposes for which the wood is destined; the higher temperatures are especially used in seasoning softwoods (coniferous timbers).

It may be noted that experiments have been made on seasoning with rarefied air, but do not appear to have resulted in the evolution of any commercial kiln.

The account of seasoning of timber would be incomplete without mention of certain preparatory treatments sometimes adopted as a preliminary to either natural or artificial seasoning.

Timber is sometimes soaked or stored for a long time in water. This washes out some of the constituents, and therefore renders the timber less hygroscopic. It tends, therefore, to cause it to shrink slightly more, but swells slightly less than is normally the case.

Sometimes timber is soaked in salt water or treated with hygroscopic salts, such as commercial magnesium sulphate, or with a saccharine solution. Treatment with hygroscopic salts tends to reduce shrinkage but increase swelling.

In one process of soaking with saccharine solution, known as Powellizing, heat is the agent employed to induce penetration of the sugar.

In so-called "senilization" of wood solution of magnesium sulphate or other substances are caused to enter by continuous or alternating electric currents.

It is conceivable that the soaking with hygroscopic substances renders it possible to employ more rapid methods of drying without deleterious results; but this has not been demonstrated.

Discussion

Mr. Legros (Past-President)

said the lecture was very instructive, and explained a number of the phenomena met with in wood which had always been difficult to understand thoroughly.

The drying of timber without destroying the strength had always been a big problem. It was thought at one time that spokes of gun carriages could only be seasoned by being kept about forty years in stock, and oak and ash for railway carriages were also kept in stock for many years. The same applied to wood used in agricultural implements. In England forests were now being cut down, but the wood was mostly only fit for pitwood and box-making. The subjejct raised by the lecturer would become even more important later on than it was at present. People were now making such things as gramophone boxes out of the scraps from aeroplane works, and a big price was being obtained for such small timber, as it was well seasoned and workable.

Woodwork formed a large percentage of the industrial work of this country, and after the war it would be important that the wood-working industries should be supplied with satisfactory material.

Lieut. A. P. Thurston, R.F.C.,

said the aeroplane was a most highly developed engineering structure, and timber formed its most important constituent, and therefore they could not know too much about the properties of timber.

Having had some little responsibility in connection with aeroplane design, he had often had to search records and make experiments to obtain such information, but what he knew he did not intend to say. He had found the reports of the Forestry Division of the United States of the greatest use. It was time this country had a corresponding service, and he would like to suggest that Professor Groom should have a responsible position in that service. He would like to ask Professor Groom to prepare a table giving information as to compressive and tensile strength, the modulus of elasticity, shear strength—radial, tangential, and transverse—of timber, taken from the same tree and subjected to natural seasoning and to the various artificial processes. This was wanted urgently if designs were to be drawn scientifically. He would also like to know what was the effect of the drying on the shear strength, radial, tangential, and longitudinal. The effect as regarded compression and tension was well known. He would also like to know of a good process of seasoning.

Dr. Kernot

said it was stated that there was a difference between wood artificially seasoned and that naturally seasoned. He believed there was a difference in the mechanical properties, but he did not know whether Professor Groom meant only the mechanical properties but also other properties. He (Dr. Kernot) did not think the seasoning of wood meant only the elimination of water. The seasoning ought to be looked upon also as a chemical transformation of the substance of the wood. In natural drying there was the action of the oxygen of the atmosphere together with the ultra-violet rays, and the action of bacteria, which probably caused the transformation of the carbon hydrates contained in the wood, and also probably the destruction of some of them and the formation of new ones. The formation of new compounds and the elimination or destruction of others had a lot to do with the mechanical properties of the wood. Probably if the natural drying could be imitated an improvement on the present artificial systems would be obtained. Carpenters and experts in wood preferred not to use artificially seasoned spruce because, they said, it had no lag, and he believed that was connected with the chemical transformation of the substance of the wood. He believed that researches had been started in America from the chemical point of view, and he thought they should start the same kind of work here, and they all looked to men like Professor Groom to be guides in that research. He believed Professor Groom already had the idea of starting that work. In England woods selected without any knowledge had been used for dry distillation. We had some kinds which were excellent for the production of acetic acid and therefore for the production of acetone, which was important at present. Other woods gave a large amount of methyl alcohol and no acetic acid. So far as he knew, at present no distinction was made between the two woods, and they were distilled together without any selection. If there were a laboratory in which the chemical changes in the natural seasoning could be ascertained an improvement could be made in the artificial seasoning, which at present consisted only of the elimination of water.

Capt. Kennedy, R.F.C.,

said he was pleased to learn that artificial seasoning produced a satisfactory product, as it would be essential for the supply of material in the future.

Capt. Bishop, R.F.C.,

said he thought something more than mere drying was necessary. He once witnessed a process of "cooking" the wood prior to drying, and the amount of foreign matter that came out of a balk of timber was amazing.

Mr. Powell

said Professor Groom was an eminent botanist and knew all about the life and structure of timber and vegetable products, but he (Mr. Powell) did not think a botanist was the ideal man for knowing how timber might be seasoned. Timber, in the first place, was strengthened by the introduction of sap, introduced by nature into the plant, but how timber could be stregthened by evaporating the water he failed to understand, and they had not been told that in the lecture. Most people in England only wanted facts and did not care how they were produced. If they got suitable wood by an artificial process they did not want months of inquiry in a laboratory to show why it was produced.

Mr. Howard

emphatically disagreed with Mr. Powell. He, as a man with nearly 40 years' experience of observation, buying, selling and distribution of timber, was astonished to hear any man suggest that the scientific inquirer had not benefited the practical man. It was the want of such scientific instruction from which England had been suffering He knew of a case where a theoretical student made a discovery which chemists had been seeking for more than a quarter of a century. The objejct of the process of desiccation was not to make timber stronger, but to render it useful in a much shorter time than would be possible by natural seasoning, and to leave it no less strong as the result of the seasoning, if possible. The more light that could be thrown on the subject the better it would be. One wanted to know the qualities of the various timbers and treat them accordingly.

Mr. A. E. Berriman

asked whether artificial seasoning was a proved proposition technically on a commercial scale. Could wood be seasoned artificially in commercial qualities with assured success—he meant rather in a financial sense? The objejct of that question was to obtain an answer to a further for large timber users and dealers to put down question, whether it was to-day a national duty

THE FOKKER TRIPLANE*

IT has been one of the features of the development of German aeroplanes during the war that, up till comparatively recently, their performance has been obtained by a constant increase in engine power rather than by highly efficient aerodynamical design. Such refinements as stream-lined cables, and "spinners" over the propeller boss were not in the past a characteristic feature of German aeroplanes. As, however, the demands for better and still better performance grew, the Germans were obliged to pay more attention to such details, and such machines as the Albatros chaser, with its stream-line semi-monocoque body, was one of the manifestations of this attempt at increased efficiency. The Fokker triplane marks a further step in the battle against that enemy of efficiency, Kx, once expressed by Mr. A. E. Berriman, we believe, as the price paid for the lift. In the Fokker triplane this price has been reduced to what would appear to be an irreducible minimum. So far has the designer gone in his reduction of head resistance as to eliminate all trace of external lift bracing. The Fokker triplane can, therefore, be said to be of the "wireless" type; more truly so than is the case with, for instance, the Curtiss "wireless" in which, although no wires are employed, the struts sloping out from the landing wheels to the lower plane perform the function of lift wires.

No such struts are fitted on the Fokker triplane, the internal construction of the wings being designed to provide all the strength without any external aid of any kind. The interplane struts, which are really ties rather than struts, might conceivably have been omitted altogether, and so far as one is able to judge, their only function is to help to distribute the load more evenly between the three wings. It is well known that in a biplane the upper wing carries about four-sevenths of the total load (when the wings are of equal section, span, and chord) and the lower wing about three-sevenths. In a triplane much the same distribution is found, with the exception that the middle and lower wing each take a share (not equal) of the three-sevenths of the total load.

In the Fokker triplane the upper wing is of larger span than the middle wing, which in turn is of slightly greater span than the lower wing. In consequence, as the three wings appear to be all of the same section, the upper wing must carry more than four-sevenths of the total load. In order to provide a better load distribution, the middle and lower wings are made to cary their share of the load on the top plane by connecting them to this *via* thin high fineness ratio strusts, which are in reality ties as they are working in tension. This explains why the struts are so extremely thin (about ½ in.) and the moment of inertia of the strut section would be so small that the struts would buckle under a very small load if subject to compression.

The fact that no lift bracing is employed naturally necessitates wing spars of considerable depth if the spar weight is to be kept reasonably low, and in the Fokker triplane this has been attained by making the wing section very thick in proportion to the chord. As a matter of fact the section is a far greater percentage of the chord than any we have ever seen on a modern aeroplane. For the time being we cannot go into details. This must be postponed until we do a full description of the Fokker, but roughly we should say that the maximum camber is in the neighborhood of one-eighth of the chord.

The two wing spars are placed very close together, and are enclosed in a box of three-ply wood. The function of this box is two-fold, it increases the strength of the spars for taking bending and at the same time acts as internal drift-bracing. At the moment of writing we are not able to say whether or not any other drift bracing is employed, but we are inclined to think that this function is performed solely by the ply-wood box.

The upper wing, which is in one piece, runs right across, and is supported on struts sloping outwards as in the Sopwiths. The other two wings each have a centre section rigidly attached to the body, the middle one resting on the top longerons and the bottom one running *underneath* the lower longerons, an aluminium shield streamlining the normal surface presented by the deep flat sides of this spar.

From the illustrations it will be seen that the gap is unusually small, being very considerably less than the chord. The inefficiency thus caused is partly made up for by staggering the wings but even so one would imagine the machine to be somewhat inefficient. The interference owing to too close spacing of the wings chiefly affects the lift co-efficient, and as the machine is probably very lightly loaded—compared with the majority of German machines—it is possible that the landing speed is not excessive.

Strictly speaking, the Fokker is not a triplane. It would be more correct to term it a three-and-a-half plane, as the wheel axle is enclosed in a casing of plywood which has a section somewhat similar to that of the wings. Experiments have shown that floats of such a section as to have a deeply cambered top surface may be made to support their own weight during flight. In the case of the Fokker triplane it appears probable that this ply-wood casing around the wheel axle carries a not inconsiderable load during flight. Its section appears capable of supporting a fair load per square foot of area, and its inefficiency due to low aspect ratio is probably less than one would expect in a plane of an aspect ratio of about two, on account of the proximity of the covered-in wheels to the tips, the effect of which must be to stop end losses to a considerable extent.

As regards the body of the Fokker triplane this is constructionally very similar to that of the Fokker monoplanes. Longerons as well as struts and cross members are in the form of steel tubes, and are joined together by welding. The internal bracing of the body is peculiar in that the bracing wires are in appearance in duplicate, although they are not so in effect.

The arrangement, to which we shall revert again when dealing with the Fokker in detail, does not appear to possess any other advantage than that in each bay only half the number of loops have to be made in the wires.

The tail plane, as well as the elevators and rudder, is made of steel, and is of a symmetrical section, much thinner than that of the Albatros, but otherwise similar to it in that no external bracing is employed. While this is quite satisfactory in the Albatros on account of the thick tail plane spars employed, it appears wholly inadequate in the Fokker, as the plane is very thin, and since, moreover, the trailing edge of the tail plane is a steel tube, which section, as is well known, is not a good one for a laterally loaded beam, owing to the fact that much of the material is massed around close to the neutral axis where it is not taking very much of the load.

As exhibited at the Enemy Aircraft View Rooms the Fokker is not complete inasmuch as the engine has been removed. The cowling shows without a doubt that the engine must have been a rotary, and the mounting is of the type usually employed for rotary engines, *i.e.*, a main engine plate bolted to the nose of the body, and a pyramid of steel tubes, supporting at its apex the rear end of the crank-shaft. A sheet of aluminium is place immediately in front of the engine plate. The manner of cowling in the engine will be apparent from our illustrations, and does not present anything of particular interest, following as it does conventional practice.

Although they are not in place in the machine as exhibited, it is evident from the aluminium casings for the cartridge belts that two synchronised machine guns have been fitted, one on each side above the fuselage. The usual triggers, operating the guns through Bowden cables, are mounted on the control lever, which latter is of the usual type.

Painted on the side of the fuselage are the following data relating to the weight of the machine: Weight empty, 376 kg., useful load, 195 kg., total weight, 571 kg. (about 1,250 lb.).

With these brief particulars we must leave the Fokker triplane for the time being, but later on we hope to return to it again, and to be able to give illustrations of some of its more important constructional details.

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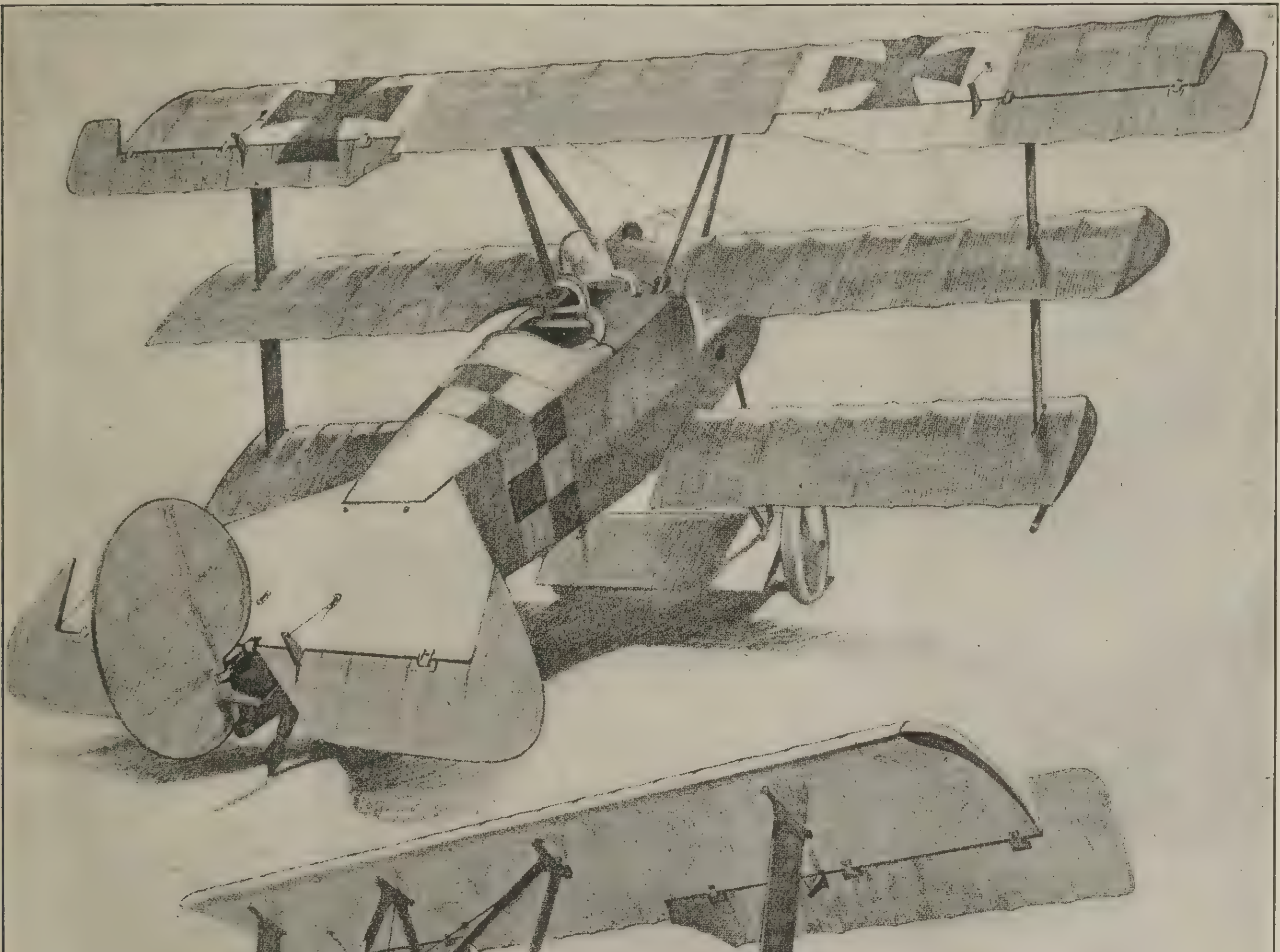
* Courtesy of *Flight*, London

PERSPECTIVE SKETCHES OF THE GERMAN FOKKER TRIPLANE



The upper sketch shows a three-quarter rear view of the Fokker Triplane. This illustration gives a good idea of the general arrangement of this interesting machine. Note the small veneer plane enclosing the wheel axle. Below is a three-quarter front view of the Fokker Triplane. The thickness of the wings can be imagined from an inspection of this drawing. The pin-jointed struts are really ties rather than struts as they are working in tension.

FOREIGN NEWS

FRANCE

Reporting on aerial operations the announcement of April 10th says:

"It is confirmed that five additional aeroplanes have been brought down."

According to the day announcement of April 11th:

"On April 10 two German aeroplanes were brought down by the fire of French machine guns."

The night statement of April 11th reports:

"In the mouth of March twenty-eight German aeroplanes were brought down."

Extensive operations are described in the French announcement of April 12th:

"On April 11 our pursuit aeroplanes engaged in numerous combats, in the course of which two German aeroplanes and a captive balloon were brought down. Twelve other German machines were seriously damaged and fell within their own lines. The same day our escadrilles dropped 16,000 kilos of projectiles on the railway station at St. Quentin, depot and aviation grounds north of Montdidier. A violent fire destroyed hangars at Campien and an explosion was noted in the St. Quentin station. It is confirmed that an aeroplane and a captive balloon of the enemy were destroyed on March 23 and two aeroplanes on March 31."

The French official statement of air operations of April 13th says:

"On April 12 our aeroplanes displayed great activity along the whole front, particularly in the regions of the Somme and the Oise. Our pursuit machines carried out more than 350 sorties and fought 120 engagements. Eight enemy aeroplanes were brought down, 23 others fell within their own lines, seriously damaged; five enemy captive balloons were set on fire, five others, pierced by bullets, dropped precipitately to the earth.

"Our bombing machines likewise carried out demonstrations. In the day of April 12 and the night of April 12-13 a total of 48,000 kilos (nearly fifty-three tons) of projectiles were dropped in the course of these expeditions, in which Italian machines took part. The railway stations of Jussy, Roye, St. Quentin, Nesle, Ham, Guiscard and Noyon, railways, cantonments and numerous convoys in these regions, as well as the stations at Hirson, Laon and Montcornet, were copiously bombed. Several fires and explosions occurred."

German aëroplanes attempted a raid on the Paris district. The official statement on the raid issued April 13th states:

"German aeroplanes crossed the lines going south. Only two succeeded in flying over the Paris district, dropping a few bombs. The number of victims is not yet known."

Later reports state that eleven persons were killed in Paris and fifty injured.

French aviators have discovered the location of the big gun with which the Germans have been bombarding Paris at long range, and the continual bombardment of the spot by the French artillery and bombing by the airmen have made the handling of the piece difficult. This explains the intermittent fire of the long-range weapon.

The piece is mounted at Crepy-en-Laonnois, near the road from La Fere to Laon.

Le Matin learns that Flight-Sergeant Paoli, having succeeded in escaping from a German prisoners' camp, has arrived at the French frontier.

It is announced by the *Temps* that the Duc de Chevreuse has been killed as the result of a flying accident while training as an aviator.

GERMANY

"Capt. von Richthofen achieved his seventy-seventh and seventy-eighth aerial victories," says the official report of April 8th.

A summary of a month's activity is officially made on April 9th:

"The losses in March of enemy aerial fighting forces in the Western theatre amount to twenty-three captive balloons and 348 aeropalnes. Of the latter, 158 were brought down behind our lines. The others were observed to fall within the enemy's positions. We lost eighty-one aeroplanes and eleven captive balloons."

Combat activity is reported on April 11th by the German War Office:

"In aerial battles during the last few days thirty-seven enemy aeroplanes and three captive balloons were shot down. Lieut. Menckhof attained his twenty-fourth aerial victory."

The official communication on the recent air raid against England issued from Berlin on April 14th says:

"On Friday night Frigate Captain Strasser, with one of our marine airship squadrons, attacked important storage, manufacturing and shipping places connected with war industries in central England. Birmingham, Nottingham, Sheffield, Leeds, Hull and Grimsby were bombed.

"Despite the extraordinarily strong gunfire encountered and pursuit by airmen, all our airships returned safely."

Two of the "star" German pilots have recently been killed in action. Lieut. Buddecke, who has been killed on an Eastern front, had received the Order Pour le Merite, and was claimed to have brought down twelve enemy machines, while Captain Baron von Tutscheek, the victim of a French pilot, is credited with twenty-seven victories.

The Munich correspondent of the *Lokalanzeiger* says that the Bavarian airman, Max Muller, has been killed in an accident due to engine trouble He stood next to Baron von Richthofen in the number of victories claimed for him, namely, thirty-eight.

GREAT BRITAIN

An official statement on aerial operations April 10th says:

"During the morning the whole front was covered with a mist, which prevented any of our aeroplanes leaving the ground. Later in the day, when there was a slight improvement in the weather, our machines reconnoitred the new battlefront between La Bassée and Armentières and bombed and engaged with machine gunfire the enemy's attacking troops.

"Hostile low-flying machines also were active in this sector. Four of these machines were brought down by our aeroplanes, and one was shot down by our infantry. Two of our aeroplanes are missing."

The British War Office reports the following aerial activity on April 11th:

"The weather Wednesday was very unfavorable for flying, but as soon as it was possible to leave the ground our aeroplanes went out to reconnoitre the battelfront. Useful information was brought back as to the position of the enemy's troops, which were attacked with bombs and machine gun fire. Enemy low-flying machines also were active on this front. Three were shot down in our lines by intantry, four were brought down by our aeroplanes, and one was driven down out of control. Seven of ours are missing.

"At midday to-day we raided the Luxemburg station and over a ton of bombs were dropped. Several bursts were seen on and around the station. All our machines returned."

The following official statement on aerial operations was issued on April 13th:

"Atmospheric conditions were favorable Friday and a great concentration of our machines was effected on the battlefront. A large number of low-flying machines were employed in bombing and sweeping with machine gunfire roads packed with enemy troops. Thirty-six tons of bombs were dropped and more than 110,000 rounds of ammunition were fired.

"In the meantime other formations, flying at a greater height, engaged the enemy planes, which were extremely lively in this sector. *Forty German machines were brought down and twenty others were brought down out of control.* Two were brought down by gunfire. Twelve of ours are missing.

"Incessant bombing was carried out between dark and dawn. More than twenty-two tons were dropped on the Douai railway station and roads leading to the battle front in the neighborhood of Estaires."

An official statement on aerial operations April 14th says:

"On Saturday it was cloudy and misty, but our low-flying machines dropped 1,200 bombs on enemy troops on roads leading to the front. Only a few fights occurred and the results were indecisive. One of our machines is missing."

Five persons were killed and fifteen injured in a German air raid on England. The official announcement of April 12th follows:

"Four airships participated in last night's raid. Two of them penetrated a few miles inland. Of the other two one reached the midlands and the other nearly reached the northwest coast. The raiders were traveling at a great height and showed no inclination to attempt to penetrate defended areas.

"Most of the bombs were dropped in open country, and apart from the demolition of four houses at one place the damage so far reported is inconsiderable. Particulars of the casualties will be published later."

Perry Robinson, writing to the *Daily News* Monday sent the following despatch from British correspondents' headquarters on April 10th:

"Day before yesterday (Saturday) was a bad day in the air, when sixteen of our machines failed to return. We have had the same thing before during Flanders fighting on a somewhat similar scale. In the early part of the day the visibility was good and the air perfectly clear up to 4,000 feet and more. Then suddenly a mist came driving before a rising westerly wind, making the whole air dense down to within 400 feet of the ground.

"Losing their way and buffeting against wind which rose to a gale, our men came straggling in some hours after they were due, and sixteen did not come back at all that day. Only a few days before, however, when somewhat similar conditions occurred, out of thirteen who failed to return the first day, five afterwards came in, having landed at remote spots whence they could not communicate with their commands."

GREECE

The Greek Admiralty has authorized the employment of a woman seaplane pilot, Miss Demise Kalimeri, who is the daughter of one of the government aeroplane engineers.

ITALY

Several squadrons of Caproni aeroplanes are operating at the French front, being employed for bombing purposes, according to diplomatic advices received in Washington. The Italian aeroplanes were said to be doing effective work with both the British and French armies.

These machines are identical with the giant Caproni biplane which flew from New York to Washington and is spending a week co-operating with the Liberty Loan Committee in that city.

KOREA

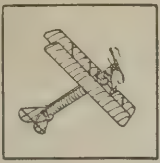
The *Chinese World,* a San Francisco publication, received advices from Shanghai on March 25th, reporting that an aeroplane, believed to be a German machine on scout duty, had appeared over Korea.

What part of Korea the flier had been reported from was not disclosed in the telegram.

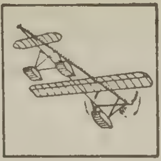
NORWAY

A fast aerial freight and passenger service is to be maintained between Norway and Scotland by hydroaeroplanes. Machines are being designed by Captain Gyth Dehle, who has had charge of the Norwegian Naval Hydroaeroplane Works. When in service it is estimated they will make the trip from Stavanger, Norway, to Aberdeen, Scotland, in less than five hours.

Norway's plan to obtain foodstuffs for her starving population in spite of the continued German U-boat campaign became known recently, when the report of United States Consul H. E. Carlson at Christiania, Norway, was made public.



MODEL NEWS



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A Scale Model of the Pomilio Aeroplane

BELOW are shown some photographs of a very real looking model aeroplane. It is interesting to compare the pictures of this model with photographs of the real machine, shown in the April 15th issue of AERIAL AGE. All the details have been correctly carried out in the model, and even the controls work in a realistic manner.

The engine cowling is of aluminum, and the body and surfaces are covered with aeroplane linen, doped and varnished to a high finish. A miniature machine gun is mounted at the rear, fixed so that the gunner's seat revolves with the gun ring to which the gun is attached.

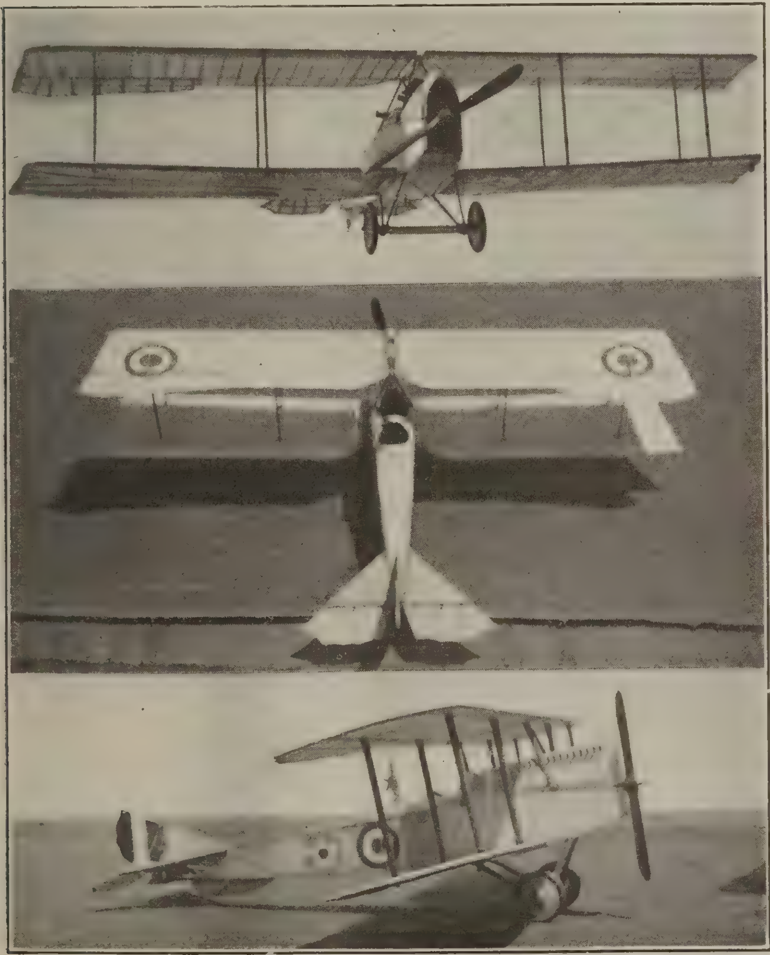
Dimensions of the Pomilio scale model are as follows: Overall length, 2′—8¼″. Span of both planes, 7¼″. The gap between the planes decreases from 7″ at the body to 6½″ at the wing tips. Overall height, 11½″.

Struts between the planes are located 9¼″ from the center-line of the body, and other struts 9½″ from middle struts; overhang 4½″. From front to rear the struts are spaced 4½″ apart.

The body is 2′—5½″ long, 4¼″ deep at the forward end, 5¼″ deep at the passenger's seat and 1½″ deep at the stern. It is 2″ wide at the radiator, 3¼″ wide at the passenger's seat, tapering to the stern.

The span of the tail plane is 10¼″; depth, 5″. Span of the elevator, 13″, depth 2¾″. The rudder is 5″ in height, overall. Wheels are 2¾″ in diameter and are spaced 6½″ apart. The axle is bound to the chassis by rubber bands.

The model bears the insignia of the United States Air Service—white star in a blue circle, with a red circle in the center—and the insignia of the Royal Italian Air Service—a red disc surrounded by rings of white and green.



A "true to scale" model of the Italian Pomilio Reconnaissance Aeroplane, built by a workman in the Pomilio Aeroplane Factory

Hollow Spars for Model Construction

F. J. Camm, in "Aeronautics" tells of some easy methods of making hollow tubes for model fuselage construction. One method is to wrap thin sheet spruce around a former of a length of circular section wood (a dowel stick), or metal tube, lapping and gluing the edges. A piece of brown paper must be folded around the former to prevent the glue from sticking the spar to it.

Another way of building up hollow tubes is to use a paper-covered former as before, and folding brown paper around this until a tube of suitable thickness is obtained. Each layer of paper would require to be coated with very thin glue. Although inclined to be heavy, great strength is possessed by such construction. In a flying model the tubes can be made to enclose rubber strands for driving a propeller, thus eliminating resistance which exists when the strands are exposed.

A method of making a hollow rectangular spar is to cut a deep groove in one side of a solid spar and then to glue a thin strip over the open side.

Another form of hollow spar is the H Section, which can be much improved by closing the channels with a silk tape binding. Strength is imparted to the spar by so wrapping. The same applies to the X section spar. If yellow Japanese silk tape is used for the binding and afterwards finished with two coats of varnish, the result is a spar that will be unaffected by dampness and of a rather pleasing appearance.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Don't Read Them—Sing Them

Tune: "My Old Kentucky Home."
I've got a sneaky feelin' round my heart that I want to bomb a town.
I guess I'll pack my grip and take a trip where I might drop somethin' down.
Now I'm helpin' in this war
I'll give Master Boche "what for!"
There's a lesson due to Essen,
I'll be tickled to death to know
That I can fly right there over Fritzy's happy home.
I guess I'll make a fuss on my Detroit 'bus
With my new Kentucky Gnome.

[*This does not necessarily mean that the Gnome motor is now being made in Kentucky. I put that in to mislead the Huns. Also because it rhymes.*]

Tune: "Way Down in Tennessee."
Way down in Tennessee
Just try to picture me
Doing my first v.p.—
It put the wind up me.
All I could do was keep hold, and forget what I'd been told,
My knees knocking something shocking,
Both my feet felt cold.
The roses round the door
Appealed to me no more,
I saw my stern C.O.
And friends I used to know,
And they were right there to meet me—
You should just have seen them greet me—
When I flew back—yes, I flew back
To my home in Tennessee.

[*Excuse my interrupting again for a moment, but I want to make it clear that I do not mean to indicate that a training depôt for Zepp.-strafers has been established in this well-known locality. One has to be so careful of these D. O. R. A. Regulations, and I should hate to give information to the enemy—unless I knew it was wrong.*]

Tune: "You'll Always Be the Same Sweet Baby."
You're my precious little Sopwith,
You are all the world to me,
You're the kind of 'bus to stop with.
(*N.B.—I could'nt avoid that rhyme.*)
And when the weather's warm and you feel in form
There's oh! oh! oceans of climb in you.
When the Huns are round about me
Life is not too full of glee,
But when my motor's dud and the Archies burst
'Till I get cold feet and an expensive thirst
You'll always be the same old Sopwith to me.

Tune: "The Long, Long Trail."
There's a long, long raid a-coming
Into the land of the Huns,
Where the Eau-de-C'logne is humming
And where Krupps make guns.
It's a long, long time we've waited,
And we've behaved far too well.
But now we're going to give those Germans
What Lloyd George called—"Hell!"

Tune: "Dixie."
I come from Dixie—I said from Dixie,
In the land of cotton I learned to fly.
To land in cotton is pretty rotten,
And I've often gotten cotton in my eye.
But flying to a rag-time tune is all the rage,
I take up lots of niggers in my Family-Page,
They sing with fervor, and my observer
He sings of Dixie too.

[*If I may butt in again for a second, I would like to draw particular attention to my new name for the Handley-Page. In view of its marvellous passenger-carrying records I think I've found a good one. But let the music proceed.*]

Tune: "Every Little While."
Every little while I hear an Archie,
Every little while a bit goes through.
My fabric's tearing—I can't help swearing,
The sky is bright blue, and I'm blue too.
(*With the cold and with funk, lor' love yer!*)
Every little while I think they've got me,
Every little while I hate their style,
(*Now I'd like to be home!*)
And while I keep on flying through it
I wish they wouldn't do it,
But they may keep missing all the while.

Tune: "When You're All Dressed Up."
When you're all dressed up and your motor won't go,
Life seems weary, dreary and slow,
You get an aching head and bad words are said
When you've nowhere to go, unless it's back in the shed.
And when your Flight-Commander comes on the field
To the spot where your big 'bus has been wheeled
And says, "Why—ain't you gone?" Your answer is "No!
I'm all dressed up, but the motor won't go."

Tune: "It's a Long, Long Way to My Home in Kentucky."
It's a long, long way to the middle of Potsdam,
Where the Kaiser hangs round the old palace door;
It's a long, long way, but when once we get started
With our T.N.T. we will give him "what for!"
So, weep no more, my Wilhelm,
Just push those beers away.
It's a long, long time we're been talking about it,
But we're bound to get there some day!

And, in conclusion, a sample verse and chorus from "The Broken Doll," as it might be sung by a pilot who has just returned from a flight over the lines, with a new gunner-observer, who looks pretty, but can't shoot for nuts:

I wonder why I always fly the way I do,
But now it seems that all my schemes go wrong through you.
I used to bring the Boches down in days gone by,
But all that now is changed somehow—I wonder why!

Chorus:

You climbed into my 'bus an hour ago,
I thought that you looked very nice to know;
You said you could shoot well—I thought you knew,
Though I've had dud observers long before I met you.
The Huns kept flying round us all the while,
But you missed every one by half a mile.
If that's your form today, I am sorry to say,
You're as useful as a Broken Doll!

Well, there are a few suggestions for you, and I hope they will inspire some budding song-writer to try and go one better—for I cheerfully admit it might be done. To the American Air Service I say, "Welcome to Europe! Have as merry a Christmas as you can. Sing while you have the chance, for there's heavy work ahead of you. We are counting on you to help to end this horrible war, and when it's over we'll sing rag-time and any old thing you like, however rotten the rhyming!"

Douglas W. Thorburn,
—*in Flight* (*London*).

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plant to meet what was an existing emergency. The objejct of these questions was to obtain a basis upon which to judge whether such plant would probably be profitable after the war. Was there any existing timber seasoning plant that was worthy of immediate use?

Mr. Clifford

said the lecture indicated that heavy woods were stronger than light ones. He would like to ask how Professor Groom would reconcile that with a condition that came to his (the speaker's) notice. He had to make some small wood parts the strength and weight of which were of vital importance. He took a piece out of a plank of ash and cut it into pieces of 1-in. section. It had perfectly straight grain, and he was informed by experts that it was a healthy looking piece of wood. When he tested the pieces the load they carried varied 100 per cent, and the fractures occurred in every direction. He did not know whether it was naturally or artificially seasoned.

Mr. Evans

asked whether the lecturer could give the results of seasoning in a vacuum and in high and normal temperatures.

Lieutenant-Colonel R. K. Bagnald-Wild

said some of those who had joined in the discussion appeared to be looking upon the matter primarily from the aeronautical side, and hardly realized what it meant from the automobile point of view. It was important that they should get busy quickly after the war, and artificial seasoning must be used. There was very little seasoned wood left at present.

Would Professor Groom state his experience as regarded close control of temperature in kilns? The A.I.D. had rejected a lot of wood, and the trouble was traced to lack of control of temperature. He thought a hydrometer was a necessary portion of the testing outfit. Were the speed of drying and the temperature control essential features in kiln drying? They wanted to know if a certain percentage of moisture went into the kiln what was the percentage when the wood left the kiln, and whether that percentage could be varied for different classes of work. Would it be safe to work on, say, 15 per cent for high-class work where wood was going to be stressed highly, and could the percentage be much more for less important work? Research should be encouraged in every way. Size varied with humidity. In the A.I.D. they had passed on wet days wood which had been rejected on dry days, but by the use of hydrometers they had defeated that ruse of the contractors. There was not going to be any scrap out of propellers, as they used the little bits glued together. A Paper giving hints as to the avoidance of waste would be valuable.

He proposed a hearty vote of thanks to Professor Groom, and it was carried unanimously.

Prof. Groom

replying to the discussion, said he did not think the problem mentioned by Dr. Thurston, as to the comparative results of drying by natural and the artificial processes had been satisfactorily settled. It was a complex question, though it sounded simple. The qualities of a piece of timber varied as one proceeded outwards from the centre and also as one proceeded upwards from the bottom to the top of the tree, so it was difficult to get exactly comparable parts of the tree.

With regard to the effect of dryness on the shearing strength of the wood, if one gradually dried a piece of wood, the co-efficient of elasticity and, above all, the compression strength, and to a considerable extent the elastic limit and the bending strength, were inversely proportional to the amount of water content. The curve was linear in relation to moisture contents at various strengths, but so far as he knew no exhaustive work had been done in regard to the shearing strength in different directions. The Sturtevant and the Chamber processes were certainly satisfactory when carried out under A.I.D. inspection with autographic recorders of the temperature and humidity, and there were other satisfactory kiln processes in which the same automatic records could be used, such as the improved spray kiln, invented by the Forestry Service of the United States, which anyone could use. Excellent work was being done by the Erith kiln, and no doubt others were also satisfactory.

He thought his remark about the seasoning process being one of mere drying was rather misinterpreted. He meant the actual operation, and not the scientific explanation. It was known that many chemical changes took place. Prolonged humidity, high temperature, or prolonged steaming caused a color change. Broadly speaking, artificial seasoning had been proved over and over again to be a commercial success, so long as it was only desired to season the wood to stand well, and there was no doubt that for certain specific purposes it was a commercial success. He could not, however, answer the question whether in the future in this country woods could be seasoned so that they would be mechanically uninjured, though it was certainly a commercial success now. The extensive programme of national reconstruction would in itself largely fill the kilns of this country. The mechanical effects of the artificial process would have to be nearly as good as those of the natural process. His own impression was that the answers to both Mr. Berriman's questions were in the affirmative.

With regard to Mr. Clifford's mysterious piece of ash, ash had not been exhaustively investigated in this country. The most competent timber leader in existence, he believed, was Dr. Jancke, an Austrian, and he had written an exhaustive paper on the strength of ash from the point of view of its use in sheaves, and he gave formulæ for calculating its strength.

In reply to Mr. Evans, seasoning in vacuo had been attempted at low atmospheric pressures, and it had not been a commercial success. At every phase of the seasoning there must be a proper regulation of temperature or a moisture in the air. The statistics he had given showed the extent to which the temperature could be raised. In America he believed much higher temperatures were used than were used here. The temperature and rate had to be determined for various classes of wood by experiment. On a commercial scale he believed wood was seasoned down to six per cent of moisture. Wood dried to that extent would have to rise to its proper equilibrium, and it would absorb moisture. In a dry place it might only rise to eight per cent, but the average would be perhaps from 13 to 17 per cent. For outside work in wood that had to be varnished the figure should be about 13 to 17 per cent, but for an object that was moving swiftly the value sank much below that.

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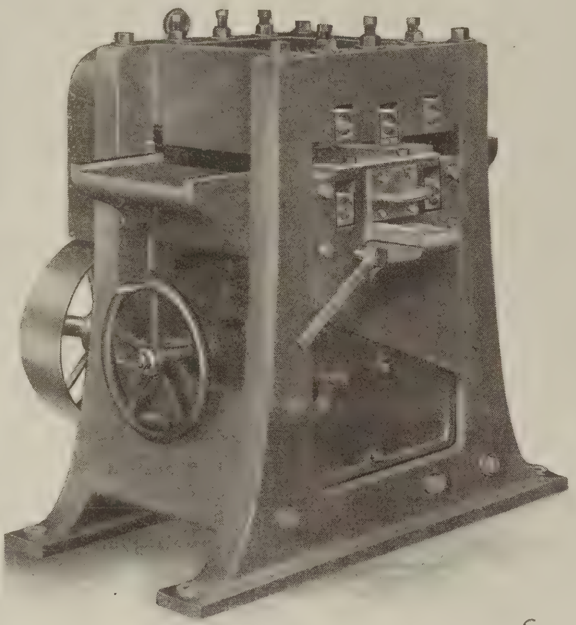

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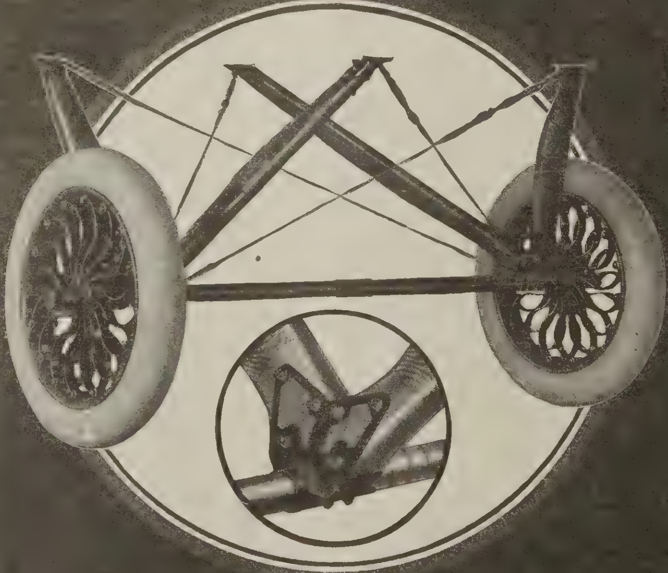

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AERIAL AGE
WEEKLY

Vol. 7, No. 7 APRIL 29, 1918 10 CENTS A COPY

Dirigible patrolling the coastline in the environs of a French seaport. (French Official Photo)

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When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
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A. S. Burleson, Postmaster-General

Cabinet Members Appeal to All True Americans to Support With Their Dollars Our Gallant Fighters in the Field

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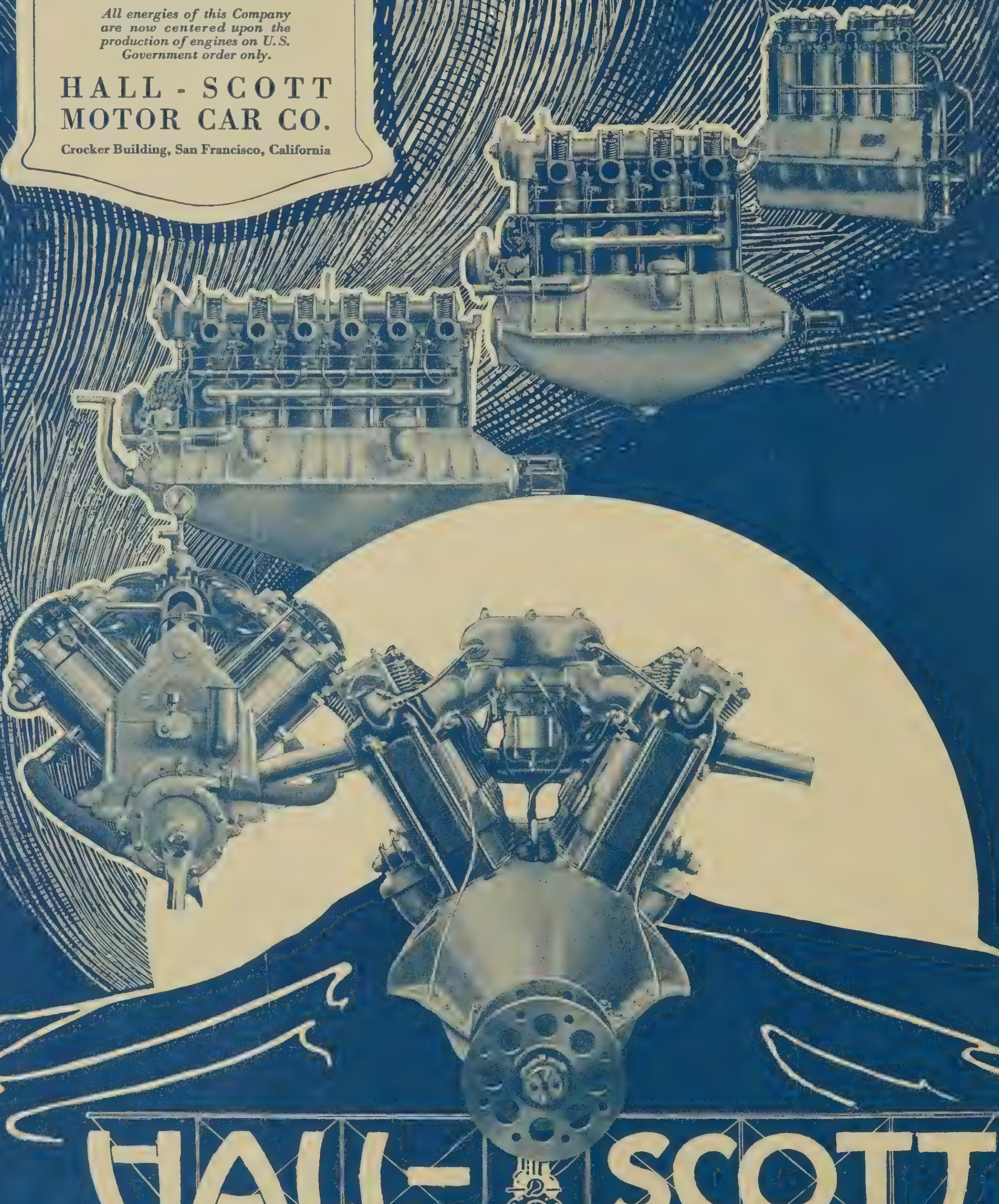

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VOL. VII NEW YORK, APRIL 29, 1918 No. 7

THRIFT STAMP DAY IN THE U. S. A.

By W. WARD SMITH, Vice Chairman Pioneer Division W. S. S.

JUST as it takes over 2,000 parts to make an aeroplane, so it takes many contributions to make up the fund to pay for winning the war.

May 6th, 1918, will be known and observed throughout the United States as Thrift Stamp Day. On that day, every store, shop, stand, booth, counter and individual in the land selling goods of any character at retail will urge every customer to accept one or more 25-cent Thrift Stamps as part of his or her change on every purchase. This, of course, applies to purchases where the amount of money handed to the clerk involves the return of 25 cents or more in change. Where the customer's change would be less than 25 cents, the clerk, before accepting the customer's money, should ask the customer if he or she will include a 25-cent Thrift Stamp in the purchase. In this way the customer will be induced to hand the clerk another quarter for a Thrift Stamp.

The Two Incentives—Patriotism and Thrift

It is appropriate that Thrift should be combined with Patriotism as twin incentives to the success of Thrift Stamp Day. Of course Patriotism should be the main incentive on the part of American business, to dispose of as many millions of Thrift Stamps as possible on May 6th; on the part of the American public, to take as many millions of Thrift Stamps as possible on that day and furnish the U. S. Government with the sinews of war needed for Victory.

But Thrift will prove an extra incentive of vital importance to the overwhelming success of Thrift Stamp Day. From the standpoint of business the Thrift incentive is this:—"Thrift Stamp Day should boom business in general throughout the country. The greater the volume of business we do on that day the more Thrift Stamps we will sell for Uncle Sam. Here is one war 'drive' that should prove a tremendous boost to the business of every manufacturer, wholesaler, jobber and retailer in the land. Therefore we will strive to make Thrift Stamp Day, May 6th, 1918, the Biggest Business Day in the History of America! We will hold Special Thrift sales of every description and offer the most unusual values in every kind of merchandise and commodity on Thrift Stamp Day, May 6th, 1918, in order to encourage the public to do a record volume of buying on that day."

From the standpoint of the American public the Thrift incentive is this:—"We will take advantage of the Special Thrift Sales and extraordinary values offered on Thrift Stamp Day to make as many purchases as possible on that day and supply all our needs for food, clothing, housefurnishings, etc.—merchandise and commodities of every description. The money we actually save through economical buying on Thrift Stamp Day will go a long way to balance the amount we invest in Thrift Stamps on that day."

The Time Is Short—Get Busy

May 6th is only a few days off. Every W. S. S. worker, every business man in the country, should try to accomplish a day's work in every hour that remains. Remember, we are all working to help Uncle Sam, to help business, to help ourselves. Let's put Thrift Stamp Day over big, and we'll make everybody happy.

If you can only grasp the immensity of this Thrift Stamp Day idea we know that your own enthusiasm will be aroused and you will communicate it to everyone associated with you in business. Never before has the whole nation set aside a day like this for doing a record-breaking day's business in every line of commodity selling at retail! It practically amounts to Uncle Sam turning shopkeeper for a day with every retailer in the United States as his partner and one hundred million Americans for customers! The possibilities for such a day's business are almost limitless.

When business closes on Thrift Stamp Day, May 6th, 1918, every retail establishment in the land, from the largest department store in the largest city to the smallest shop in the village, should have completed the biggest day's business in all their experience, and the United States Government should have added many millions of dollars to its War and Victory Chest from the sale of Thrift Stamps!

CABINET MEMBERS APPEAL TO ALL TRUE AMERICANS TO SUPPORT WITH THEIR DOLLARS OUR GALLANT FIGHTERS IN THE FIELD

SECRETARY McADOO—Treasury Department

One million eight hundred thousand of America's brave sone are now serving in the Army and Navy of the United States. Thousands of them are already upon the battle fields of France, fighting and dying to save the liberties and rights of those who stay at home and to secure democracy and freedom against Prussian brutality and military despotism. Their blood already consecrates the soil of noble France.

Who can think of their heroic sacrifice without emotion?

Who can contemplate their trials and sufferings, their dangers and struggles without setting ablaze the fires of patriotism in his soul?

Who can look upon the blue jacket of the sailor or the khaki jacket of the soldier without admiration for the indomitable hearts that beat beneath—hearts that may soon be stilled in death as the price they pay to save civilization?

We must support our gallant sailors and soldiers. We must make them swift victors in their fight with the Kaiser. We can do it if we, at home, do our duty with the same quality of patriotism that animates our men in the trenches. The least duty we can perform—and we should be eager and happy to perform it—is to lend our money, every available dollar we have or can save, to our Government in order that our gallant sons may be supplied with all they need to save America.

JOSEPHUS DANIELS—Secretary of the Navy

On this anniversary of our entrance into the war the magnitude of our task and the tremendous responsibility which rests upon America comes home to us as never before. The progress of the war has demonstrated the inexorable determination of the German war lords to impose their cruel will not only upon Europe, but upon all the civilized world, and this menace will not be overcome unless we pour out our men and our money and our every resource. With all we have and all we are fully enlisted, the victory is assured. Until the German military autocracy is crushed forever there will be no safety in the world for any of the things America holds dear. Our men in the trenches and on the ships are counting their lives as nothing and are maintaining the highest standards of American manhood and heroism. It is our privilege at home to sacrifice and sacrifice and sacrifice to provide the Government with means to carry on the war. No man who values his freedom and loves the principles upon which our Government was established can afford not to contribute to the limit to the third Liberty loan. We must buy bonds until it hurts and then buy more.

ROBERT LANSING—Secretary of State

The United States has been at war for a year. The first enthusiasm which followed the declaration that we would take up arms in the cause of liberty and justice has passed, but in its place there has come to the Nation a spirit of determination and self-sacrifice. Under the influence of this spirit the Republic is pressing forward to the accomplishment of the mighty task which this was has imposed upon it.

Already the American people have responded generously and fervently to their country's call, but their efforts must not slacken. Again they are called upon to supply the Government with the needed sinews of war, even to the extent of personal sacrifice. Let there be the same patriotic response to the third Liberty loan that was made to those which preceded it. Let this response bear witness to the unswerving loyalty of the Nation and to the intense devotion of Americans to their country's cause.

T. W. GREGORY— Attorney General

The hordes of Satan are in battle against us. They fight with every diabolical device that perverted human intelligence, training, and experience can invent. To conquer us, they use to the full their every economic, scientific, and industrial resource.

To save the lives and liberties of ourselves and our children, we have been forced unwillingly to take up arms. To prevail we must dedicate to the farthest limit our every power. No sacrifice has been too great for our enemy to place on the altar of his fatherland. Shall we give or sacrifice less for freedom than our enemy gives for despotism? What shall a hoarded penny profit us if we may spend it only as slaves? Let us give freely, that we may live free.

W. B. WILSON—Secretary of Labor

The Third Liberty Loan has an even greater significance than the first two. They were the expression of instant and responsive patriotism. This serves a grim notice on the foe that America is in the fight until the lives of its people are safe from the assaults of barbarism, its institutions secure against the attacks of autocracy, and the nations of the earth, including our own, are assured the opportunity of living their own lives undisturbed by the power of militarism. The Third Liberty Loan will, likewise, be a trumpet note of inspiration to all the brave peoples fighting with us that back of them is an inexhaustible Nation which under Providence will be their sure help and reliance. The Third Liberty Loan is in a way the first in which, unmistakably, we tell the world that America is steadfast in the battle and enlisted for the war.

A. S. BURLESON—Postmaster General

One year ago we took up the gage of battle flung in our faces by Germany. It is a righteous war, waged by our people. No more inspiring exhibition of patriotism was ever made than the response by them to the requests of President Wilson that they contribute to its support by purchasing our Government's obligations. To the inexhaustible magazines of their patriotism, their fidelity, and valor the appeal is made. He knows us not who doubts that the response will be far beyond the amount required. Upon patriotic Americans every reliance can be placed. They will prove true.

DAVID F. HOUSTON—Secretary of Agriculture

The first anniversary of the entrance of the United States into the world conflict finds the people of the Nation united in the great struggle against Prussian domination and determined to prosecute it to a victorious conclusion. The Nation's task is a serious one. It intimately touches each of us. It faces you and me. If we do not win this war we shall indefinitely face the interference of the Prussian autocracy or bear permanently the intolerable burdens of militarism. To win this war we must have both men and money. It is the duty and privilege, therefore, of every citizen who is in a position to do so to participate in the third Liberty loan campaign. He will thereby contribute directly and effectively to the successful prosecution of the war which Germany has forced upon us.

BENEDICT CROWELL—Acting Secretary of War

We are now at war with the greatest military organization that the world has ever known. Soon we shall be locked in a death grapple with this monster of militarism. It is a fight to a finish with an enemy that gives no quarter to the vanquished.

We realize the enormous task before us and we are confident of winning, but it will take the combined punch of the whole American people and will require an immense expenditure of men and money.

Did it ever occur to you to think what would happen if we failed? If we are beaten in France the struggle will probably be transferred to American soil. Plans for the invasion and subjugation of the United States are now on file in the office of the German general staff. This we know definitely. This invasion will mean that we are to suffer here all the horrors of Belgium and Poland. Mr. Reader, do you wish your wife and children to be actors in such a drama of frightfulness?

I am appealing for the success of the Liberty bond issue. It is a matter which directly affects every man in the United States. I strongly urge you to buy all the Liberty bonds that you can afford, and then a few more. There is no better investment for you on earth. Remember that the Germans issue no bonds for the money they extort from conquered peoples.

THE AIRCRAFT ADMINISTRATOR BILL

ON April 15, Congressman Gould introduced the following bill, which was referred to the Committee on Military Affairs:

A BILL; To provide for an Aircraft Administrator, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby created the office of Aircraft Administrator, to be in charge of an Aircraft Aministrator, who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall receive a salary at the rate of $7,500 per annum.

There shall be in such office a Vice Aircraft Administrator, who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall receive a salary at the rate of $5,000 per annum, to have charge of the approval of all contracts and of all funds under such rules as the Aircraft Administrator may prescribe.

There shall be in such office four assistant administrators, each of whom shall be appointed by the President, by and with the advice and consent of the Senate, and shall receive a salary at the rate of $4,500 per annum. One of the assistant administrators shall have charge of research and experimentation division as directed by the administrator. One assistant administrator shall have charge of an engineering and design division to supervise engines and planes and approve of accessories such as ordnance, radio apparatus, cameras, instruments, and so forth, which may be needed. One assistant administrator shall have charge of a production division and the requisitioning of all material, including accessories required for the product, and of a purchasing section under his jurisdiction which shall cooperate with the War Industries Board. One assistant administrator shall have charge of a distribution division which will include a traffic department to direct the movement of all purchased goods or completed product.

The Aircraft Administrator shall have full authority to lease, purchase, or construct all necessary office space or office equipment for the conduct of the business of this office. There shall also be in such office such experts, attorneys, clerks, and other employees as may be necessary, and as may be from time to time provided for by Congress.

SEC. 2. That it shall be the province and duty of the Aircraft Administrator to encourage aircraft production and to develop the science of flying, and he shall be vested with full control over the governmental activities dealing with aeronautics.

There are hereby transferred to the office of the Aircraft Administrator the Aeronautic Section of the Signal Corps of the War Department and the office of Naval Aeronautics of the Navy Department, together with all that pertains thereto, and the President shall, from time to time, as he thinks best, transfer to the office of Aircraft Administrator the whole or any part of any bureau, division, or other branch of the Government engaged in work pertaining to aeronautics, and shall assign to such office any military or naval officers or enlisted man that he may deem necessary. All unexpended balances of appropriations available for the use of any transferred bureau, division, or other branch of the Government, or which may become available thereafter, shall be available for the office of Aircraft Administrator.

SEC. 3. That there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $25,000,000 to be available immediately, for the office of Aircraft Administrator for the purpose of carrying out the provisions of this Act.

The Aircraft Production Board is hereby abolished, and the unexpended appropriations, if any, available for such board is hereby made available for the Office of Aircraft Administrator.

THE NEWS OF THE WEEK

Tardieu Reappointed French Mission Head

Washington.—Captain Andre Tardieu has been reappointed High Commissioner of France to the United States for the third successive term. News of his reappointment met with expressions of approval from officials of the State Department, the War Board, War Industries Board and Food Administration this afternoon.

Daniels, in Seaplane, Flies Over the Capital

Washington.—Secretary Daniels was a passenger with Lieutenant Doherty, a naval aviator, in a twenty-minute flight over the capital.

A service hydro-aeroplane was used.

At the American Aviation Training Camps

In order to provide more room for the Army Aeronautical School at the Massachusetts Institute of Technology, the regular classes in the department of civil engineering have been transferred to the faculty room in the Administration Building.

Chanute Field's aviators will soon be soaring over Rantoul as of old. The week-end saw the arrival of a large shipment of aeroplanes. Twenty-five flying cadets, just graduated from ground schools, have also arrived on the field, and with 250 more to come from ground schools all over the United States, the flying season will be in full swing very soon. The weather will play an important part in how soon flying will start. The field is in good shape, the majority of machines have been set up, and the flying students are also ready for their initial trips. Captain Harry M. Smith will be in charge of the flying field and hopes to have not less than fifty machines in constant commission all summer. The soldiers spent the greater part of last Sunday unloading the large shipment of planes which arrived on Saturday.

When the Flying Cadets at the University of Illinois marched in the Liberty Bond parade, they were led by a band of their own. Already four hundred and fifty dollars have been raised to make the organization of a band possible. Until now, the Flying Cadets have been forced to be content with the music which the buglers and drummers provided at retreat every evening. But within a short time the squadron, as they pass in review, will march to the lively tune of "Joan of Arc" or "Over There," played by the Aviation School Band.

Major John Purroy Mitchel had probably the most thrilling experience of his career at North Island, when he took up trick flying work. With Lieutenant Robert Mairesse, of the French Flying Corps. Major Mitchel executed a full loop, half loop, tail spin, sideslip and the Immelmann turn.

Bosch Company Taken Over By Government

Washington.—The Bosch Magneto Company of Plainfield, N. J., and Springfield, Mass., with property valued at $5,000,000, was taken over by Alien Property Custodian Palmer. Investigation revealed that instead of most of the stock being owned by residents of this country, as had been reported by its officers, ownership was in reality vested in Robert Bosch and other residents of Germany.

Carl L. Schurz of New York, whose father fled from Germany after the revolution of 1848 and became a United States Senator, now is president of the Bosch company, and he and Gustav Jahn are the directors. Bosch, who an investigation conducted by Mr. Palmer has shown is the real owner of a majority of the stock, has been in Germany since the war started.

According to evidence gathered by Francis P. Garvan, director of the Bureau of Investigation, the conduct of the company after the European war started and before this country entered the war was such as to indicate plainly its German ownership. The company, according to a statement issued, refused to take orders from the Allies, and after the United States entered the war it apparently was loath to render any service to this Government in its war preparations.

The Bosch company was largely manned by Germans and when this country declared war its president was Otto Heins. At that time Heins and many of the Germans who were heads of departments walked out of the factory and clearly showed their purpose to be to tie up the business so that it could not be used in making war on Germany. The company manufactures magnetos for aeroplanes, automobiles, trucks and other army and navy equipment.

Bolling and Miller, Reported Missing, Confirmed as Killed

Colonel Raynal C. Bolling, formerly chief counsel for the U. S. Steel Corporation, who was reported as missing in these columns last week, has, according to information received from Germany, been killed.

Captain Miller, who was last seen in combat over the German lines and was listed as "killed in action," fell in battle with two German aeroplanes, according to information obtained by Swiss officials.

Lieut. Patton, Veteran Aviator, Heads British Royal Air Force Recruiting in U. S.

Lieut. Colonel G. Francis Patton, son of the present Duke of Wellington and great-grandson of the Iron Duke, hero of Waterloo, has taken command of the Royal Air Force in New York and will push the work recruiting. Lieutenant Colonel Patton started flying in 1913 and joined the Royal Flying Corps in 1914, before the beginning of the war. He was one of the first aviators to go to France, and fought at Mons, Soissons, Marne and Aisne. Later he served in Egypt.

Mineola Proposed as Aerial Terminal

Springfield, Mass.—Details were announced here of a plan backed by the Chamber of Commerce that will be submitted to the War Departments for a triangular training course for student aviators with Mineola, L. I., Springfield and Boston as landing points.

The plan originated with M. W. Rose, a vice-president of the Springfield Aircraft Corporation, and would locate hangars on the field that is being used for trial flights here.

French Sky Fighters Presented With Auto Truck

In order to facilitate the transportation of the Official Aerial Warfare Exhibit, which is being sent throughout the United States for the benefit of the French Sky Fighter's Fund, a motor truck was presented by Mr. S. O. Ochs, a member of the Aero Club of America, on which the entire exhibit can be loaded. The truck was build as an ambulance for the Russian Government, but owing to chaotic conditions existing in that country, it was not sent there.

New War Dirigible Exhibited to Senators

Washington.—Demonstrations of a 16-foot model dirigible of the Zeppelin type swung on wires—a machine said to be much superior to the German craft in that it is more mobile and can alight on water—were given to the Senate Military Committee by Alfred Herbert, a Montclair, N. J., inventor. He said his dirigible could be built 600 feet in length, carry fifty persons, machine guns, and bombs, and attain a speed of seventy-five miles an hour.

Development of the dirigible by the Government was urged by the inventor, who said Germany in time would send Zeppelins to America.

New Wright-Martin Plant

To take care of the new government orders for 400-horsepower Hispano-Suiza aviation engines, the Wright-Martin Aircraft Corporation is arranging for the construction of a new plant. It is understood that sites at Philadelphia, Poughkeepsie and one near Atlantic City are under consideration. In connection with this contract, which has been definitely placed, the Wright-Martin Company will in the next few days enter the market for 500 machine tools, costing upward of $4,000,000.

2,000 Foot Drop is Art Smith's Art

Art Smith, the famous exhibition flier, who made eighteen successive loops at the Pan-American Exposition, is living up to his reputation for recklessness. At one of the western fields, he went up on a windy day when none of the pilots would go up, and proceeded to loop the loop fourteen times. On another occasion he flew a speedy little triplane, which no one had dared try out He rose to a height of 2,000 feet, when the machine was seen to drop down perpendicularly. The ambulance was rushed out, but Art had fooled them. All he wanted was some spark plugs and a mechanic, for just before striking the ground, he had straightened out and made a perfect landing.

Free Aeroplane Wing Covering and Repairing Course in New York School

A course in aeroplane wing covering and repairing will be started at the Murray Hill Evening Trade School, 237 East 37th Street, New York City. Three sessions weekly will be held from 7:30 to 9:30. Tailors, cobblers, awning makers, and upholsterers are eligible to enter this class. The instruction is absolutely free.

Martin Aeroplane Plant Nearly Ready

Cleveland.—The 5-acre plant being built for the Glenn L. Martin Aeroplane Co. is rapidly approaching completion, and it is expected that the Martin company will be in production in about 60 days.

The formation of this company marked the entrance into the aeroplane industry of a concern which not only intends to build war products, but which will probably be an important factor in the commercial aeroplane post-war developments.

The company is incorporated for $2,000,000 and has erected its plant on a 55-acre field, which is sufficient not only to give plenty of room for expansion but also to allow a landing and experimental field for the planes manufactured. Only in a few instances have aeroplane factories been able to obtain flying accommodations in close proximity to the plant.

Navy Asks Huge Aero Wood Supply Monthly

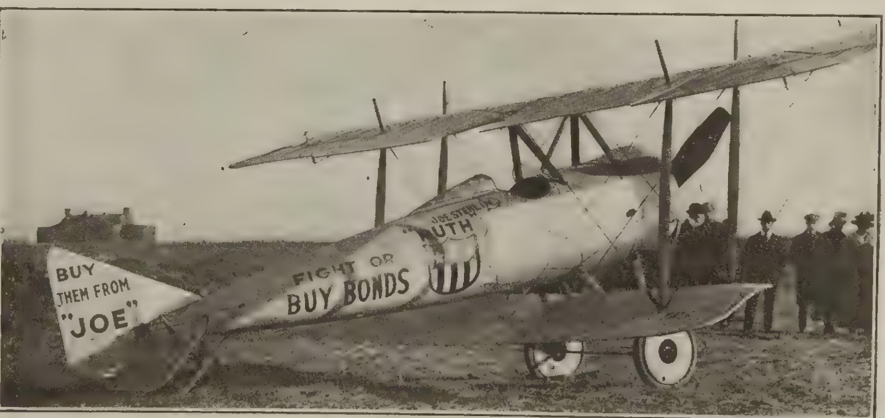
Boston.—A call for three million feet of New England spruce a month for aeroplanes was sent out by the Navy Department.

By an agreement with the army, the navy has been given the exclusive control of the development of the New England spruce. Steps already have been taken to bring the output of this material up to its maximum.

Variable Pitch Steel Aero Propeller Wanted

Washington.—A steel air propeller combining a variable pitch is sought by the National Advisory Committee on Aeronautics and the committee invites the attention of designing engineers to the problem.

The first requisite is a propeller that will fill the need for a super-charging engine, one which will enable an engine to maintain constant power at all altitudes. All aeroplane engines now in use lose power as they attain higher altitudes. When the air density is, for example, 50 per cent of the density at the



(Photo passed by Censor)

The Berckmans speed scout which is completely described on page 348.

ground, the engine loses 50 per cent of its power and is forced to double speed to attain the normal horsepower achieved at ground density.

The second requisite is that the propeller be steel, because it is believed that this will be the ultimate material for propellers. The committee advocates that designing engineers try to find the solution to both problems at one time.

Engineers of the committee offer the suggestion that the variable pitch can be controlled either by a governor, if one can be developed to alter the pitch without changing the engine's speed, or by a device at the driver's seat. They advise engineers in designing this steel propeller not to pay any attention to the wooden ones now used. They point out that when steel bridges were first made the engineers attempted to follow the design of wooden bridges and failed until they evolved new designs based upon steel strength and structure. An ideal variable pitch propeller would be one that embodies the means for changing simultaneously the diameter, area and pitch for changes in air density.

All designs will be given careful attention, and drawings should be submitted together with brief description and necessary photographs to the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C.

Col. Howard to Teach Military Science at Columbia University

Washington.—Lieut.-Col. John Howard, retired, has been detailed by the War Department as professor of military science and tactics at Columbia University, New York City.

New Aeronautic Companies Organizing in Increasing Numbers

The Milwaukee Woodcraft Corporation, Milwaukee, Wisconsin, has been incorporated with a capital stock of $25,000 by representatives of the wood-working industries of that city, to handle prospective contracts for wooden aeroplane parts and material now in negotiation. The incorporators are Marshall C. Moss, J. W. Dierckmeier, and S. H. Grobben.

The British Aeroplane Varnish Co., Union, N. J., has commenced the erection of the first of seven buildings on a property recently acquired from the Holzapfel American Composition Company and will devote a large portion of the plant to the manufacture of a special aircraft varnish. The works will cost about $30,000.

The Aero Instrument Corporation, New York, recently incorporated with a capital of $500,000, has leased property at 310 Hudson St., for a works. Initial operations will be devoted to the manufacture of altimeters for the Government. N. W. Walker and J. W. Lovell are the incorporators.

The Standard Gas Engine Co., Oakland, Cal., has completed plans and specifications for increasing its foundry capacity to double its present output. This is in addition to the recently announced additon to its main factory building and machine shop, work upon which is about completed.

The Tandem Aeroplane Co. of America, New York, has been incorporated with a capital of $100,000 to manufacture aeroplanes. The incorporators are F. Lawrence, C. Baas and F. Wallberg, 500 W. 40th St., New York.

British Air Force Announces Policy

An explanatory pamphlet has been issued by the Air Council of Great Britain wherein are set forth the rank, grading and pay of members of the new Air Force. From a careful analysis of the language of this official statement one gathers that any officer holding a commission in His Majesty's service may be transferred to the Air Force, subject to his own consent being given, except in the case of the Royal Naval Volunteer Service, which consists of reservists of the Naval Air Service, and the Royal Flying Corps, who, should they withold their consent, cannot receive a commission in any other branch of the services. The period is for four years of service, or for the duration of the war—whichever be the longer.

Promotion, so the pamplet runs, above the rank of lieutenant, will be by selection and not by seniority.

Personal Pars

E. M. Elliott, formerly manager, Department of Labor, U. S. Public Service Reserve, Washington, is now assistant factory manager, Wright-Martin Aircraft Corporation, New Brunswick, N. J.

Lieut. Col. Charles Lee, British aviator, who has been in this country for some months and who, with Lieut. Sully, also of the British flying corps, made many hair-raising flights over Washington recently, kept a luncheon engagement at the Chevy Chase Club, flying from Philadelphia in a few minutes more than one hour and landing on the fair green in front of the west terrace.

In making his landing Col. Lee broke up several foursomes, the golfers scattering in every direction when the plane swooped down on them. In landing the machine threw a tire of one of the small landing wheels, but this was replaced in a few minutes.

Col. Lee and his mechanician, who accompanied him in the flight from Philadelphia, proceeded to the city shortly before 6 o'clock, landing on the flying field at Potomac Park after doing a few aerial stunts.

Lieutenant Joseph Stehlin, the American ace from the Lafayette Escadrille, is to fly in an effort to set a new altitude record for the Liberty Loan.

More than 15,000 persons crowded the Empire racetrack, at Yonkers, to catch a glimpse of Stehlin.

Civilians Can Now Get Licenses to Fly

Washington.—The Joint Army and Navy Board of Aeronautic Cognizance, which has the power to grant licenses to civilians desiring to operate aeroplanes over the United States, its territorial waters and other possessions, which was forbidden by presidential proclamation on February 28th, has announced that applicants should give the name of the operator, the machine to be used, names of passengers to be carried, identifying markings on the machine and other details to assure the military and naval forces as to the identity of the aircraft. All communications should be addressed to the office of the Board, at 1607 H Street, N. W., Washington, D. C.

Governor Edge of New Jersey addressing the employees of the Standard Aircraft Company

Aerial Mail Schedule Announced

New York.—The aerial mail service between Washington and New York, which the Post Office Department will inaugurate on May 15th, will operate on the following schedule: Leave New York, Belmont Field, Long Island, at 11:30 A. M., arriving at Washington at 3:30 P. M., with stop, midway, at Philadelphia. The Washington to New York service will operate on the same schedule.

Letters should be mailed from New York so as to reach Pennsylvania Station Post Office before 11 o'clock in the morning, so as to be delivered in Washington in the course of the same afternoon.

Michigan State Auto School Begins Aero Mechanics' Course

Detroit.—The Michigan State Auto School has opened an aeroplane mechanics' course in order to train the men needed for the aircraft industry and for the Signal Corps. The course extends over a period of two months, and includes assembly, repair and operation of aero motors. Curtiss parts as well as a complete Curtiss J. N. 4 machine are used in the instruction.

French Congress of Civil Engineers Considers Aeronautic Problems

Paris.—The French Congress of Civil Engineers was recently inaugurated in Paris in the presence of President Poincare, for the purpose of considering important after-war problems. The aviation section of the congress listened to an address by Lieut.-Colonel G. Espitallier dealing with the possibilities of aviation after the war, and the conclusions that the Ministry of the Colonies should organize an aerial geographical and photographic section and that a regular aerial post should be established over all the colonial routes at present by caravans only. A postal service was recommended for mail and parcel post over the important routes of France, as well as between France and Corsica, Alveria and England.

The Congress being of the opinion that aerial services could not succeed unless there was some guarantee against competition, was voted that aerial police regulation should be drawn up and that concessions should be granted to aeronautic traffic corporations, with a view of preventing damaging competition.

A resolution was adopted asking manufacturers to study big load capacity and high powered aeroplanes suitable for after-war commercial conditions.

Colonel Roche urged the organization of a scientific and technical staff for the aeronautic industry and State encouragement of every organization created with the object of training aviation engineers.

R. Soreau presented a strong case in favor of constructing a low-pressure and low-temperature laboratory-tunnel for testing aeroplane motors. He pointed out that the Germans have made great progress because they have such experimental equipment. A tunnel, to cost $300,000, 492 feet long, having two concentric chambers, the inner one with a diameter of 16.4 feet and the outer with a diameter of 24.6 feet was proposed. The object of the outer cylinder is to provide a return passage for the cold air of the central chamber, thus increasing the length of time during which this air could be cooled.

U. S. Tin Prices to Be Fixed

Washington.—The War Industries Board has been in conference with manufacturers, with a view to fixing the price of tin. This product has doubled in price since the beginning of the war. Tin is now being imported from Batavia, American West Indies, Dutch East Indies, Strait Settlements and China, but the tremendous needs of the war require careful conservation of the supply.

War Industries Board Fixes Spruce Price

Washington.—Representatives of the spruce industry and the War Industries Board have agreed on the following scale of prices for spruce: On random lengths, range from $35 to $48 a thousand; on lengths from 8 to 20 ft. from $40 to $55, according to size; for every 2 feet over 20, in length, an additional charge of $1 a thousand will be made. These prices will remain in effect until July 1.

Senate Still Taking Aircraft Testimony

Washington.—Frank G. Diffin, chairman of the International Aircraft Standardization Board, who recently returned from a conference in London, and William B. Stout, technical adviser of the Aircraft Board, testified before the Senate Military Affairs Committee, in secret session.

The Inter-Allied Conference on Aircraft Standardization

At the Inter-Allied Conference on aircraft standardization, more especially in regard to materials, arranged by the British Engineering Standards Committee, was recently held in London at the Institution of Civil Engineers. The delegates were welcomed officially by Mr. Churchill, Minister of Munitions.

Sir Maurice Fitzmaurice, vice-chairman of the committee, welcomed the delegates, and explained that the standardization of the components of aircraft and aircraft engines was being carried out by the committee as a war measure for the Department of Aircraft Production of the Ministry of Munitions.

Mr. Churchill said that the thanks of all were due to the committee for having taken over this very important sphere of action, and for having relieved the Technical Department of the Ministry of Munitions of a heavy and important branch of what would otherwise have been their work. He thought that very little had in reality been lost, and in some respects much had been gained, by not entering on a general scheme of standardization until sufficient experience had been accumulated to enable such standardization to reach its maximum effect.

A too rigid standardization in the early stages of development undoubtedly tended to hamper progress and design.

Alluding to the gloomy views taken by some people regarding the war, he said that he felt that such people could have no real knowledge or appreciation of the importance and power of aircraft. German resources were incomparably less than those of the Allies, who had the whole world to draw on, and by developing these resources remorselessly it was certainly within the Allies' power to dictate a military decision to their opponents.

Mr. F. G. Diffin, chairman of the American Commission, stated that the United States were wholeheartedly in this war, as Allies and friends, with the sole desire of attaining the best possible results for the common good. He agreed that standardization could be better effected today on the knowledge of what had passed than if it had been instituted earlier, and remarked that the only way to absolute success was through complete unity of action. The work was of tremendous importance, and he firmly believed that, if the fundamentals were kept well to the fore, most effective results could undoubtedly be achieved.

Colonel Dorand, chief of the French delegation, and Deputy Giuseppi Grassi, of the Italian delegation, expressed their Governments' desire most cordially to co-operate in the work of standardization, which was fully recognized to be of the greatest value to production.

Sir William Weir, Director-General of Aircraft Production, said that he had come to the conclusion that the best results would be achieved by carrying out standardization under the direct responsibility of the Engineering Standards Committee, as that body possessed a wealth of experience in the domain of standardization generally. In particular, he had been influenced by the fact that the Committee, in all its work, had associated itself with the manufacturers and suppliers intimately concerned with the production of the material in question, and that it was able to obtain a realization of the possibilities of what could actually be done during the war—which was the most important thing at the moment. He felt sure that the conference would be of the highest value to the aircraft programme of the Allies generally.

Sir Henry Fowler, K.B.E., Assistant Director-General of Aircraft Production, and chairman of the sectional committee of the Engineering Standards Committee immediately concerned in carrying out the work of aircraft standardization in Great Britain, presided over the technical sessions, which were attended by the delegates and by a large number of officers of the departments of the Air Ministry interested in the details of the subjects discussed.

It has been decided to recommend that permanent authoritative committees be instituted in Great Britain, Canada, France, Italy, and the United States, in order to maintain continuity of action and to carry forward in the most efficient manner possible the work of co-ordination, the Engineering Standards Committee, for the time being, acting as the distributing centre of this permanent international organization. It was suggested that the Committees should be constituted as folows:

France.—M. le Colonel Dorand (Inspecteur-Général des Etudes et Expériences techniques), Captain Etevé, Captain Pierron, Lieutenant Boislevé.

Italy.—M. le Commandant Benza, Chef des Services, de la Provisionnement de l'Aviation Italienne, Député G. Grassi, and Lt. A. Bonomi.

United States of America.—Mr. F. G. Diffin, chairman of the Aircraft Standards Board of the American Aircraft Board; Dr. W. F. Durand, Lt.-Comdr. D. Briscoe, Mr. Coker F. Clarkson, Mr. E. H. Ehrman, Mr. Charles M. Manly, Mr. James Hartness, Dr. A. L. Colby, Mr. F. G. Ericson, Capt. A. Tilt, Dr. F. R. Baxter, Lt. L. Selden.

Great Britain.—Sir Henry Fowler, K.B.E., Comdr. H. Anstey, Mr. A. E. Berriman, O.B.E., Mr. P. C. Cooper, Lt.-Col. M. O'Gorman, C.B., Dr. H. S. Hele-Shaw, Brig. Gen. Sir Capel Holden, K.C.B., R.A., Comdr. C. F. Jenkin, M.B.E., R.N.V.R., Capt. G. W. C. Kaye, R.E., Mr. C. C. Paterson, O.B.E., Mr. A. A. Remington, Capt. A. A. Ross, Lt.-Comdr. E. S. Saunders, R.N.V.R., Capt. T. Worswick.

Flax Production Department for Great Britain

The closing of Russian ports and increased demand for flax for aircraft fabric has prompted the British Government to organize a Flax Production Department on the Board of Agriculture. It is intended to get 10,000 acres of crop sown in the coming spring, so as to insure an adequate supply for the year, and to provide seed for the requirements of the following year. Yorkshire, Lincolnshire, Somerset and Fife, many years ago were important centres of an extensive flax production, and it is probable that a substantial revival of that industry will now be effected. The government is to pay $41 per ton for the total crop of seed and straw, and as a fair yield is from two to three tons per acre, and the seed for sowing is to be supplied free, hence the production of flax ought to be a very profitable investment for the British farmers.

Mitchel Goggles Report Denied

Major John Purroy Mitchel did not make any report, official or voluntary, about defects in goggles in use by aviators of the United States, according to Capt. Martin H. Ray, executive officer and official censor of the aviation station at San Diego. A report to that effect emanated from San Diego recently and was widely published throughout the country.

In a letter sent out by Capt. Ray to correct the impression and to warn against some "unaccountable" source of news concerning the activity of Major Mitchel, Capt. Ray indicates that steps have already been taken for proper control of the origin of news at the camp.

Capt. Ray's letter is as follows:

"As executive officer and also official censor of the aviation station at San Diego, I have received numerous letters concerning this article. Major John Purroy Mitchel has also received numerous letters of the same character, which he has turned over to me.

"Your article was evidently based on a news dispatch dated San Diego, March 21, as other articles apparently based on the same message have appeared in other newspapers of the country. We beg to advise you that the statements made in this dispatch are entirely unfounded. Since Major Mitchel's entry into the military service, he has never been a member of any board authorized to investigate aviators' goggles, and he has never voluntarily made any report concerning goggles. In addition to this, he has never offered any suggestion concerning defective goggles. The entire story is fiction to such an extent that we are unable to account for it in any way, except that since Major Mitchel's arrival here, he has been written up as responsible for numerous things which have never taken place.

"We will thank you for correcting the impression given by the article referred to above, and trust that we will soon be able to control the system which has resulted in your unintentionally being led to publish an article no one element of which has any foundation except that Major Mitchel is stationed at San Diego."

Musicale to Aid American Aviators

Prominent society women of the National Aeronautic Committee of the Woman's Naval Service, of which Mrs. Charles A. Van Rensselear is chairman, will hold a musicale in the ballroom of the Hotel Plaza on Wednesday evening, May 1. The proceeds will be used to provide athletic outfits for the young American aviators on the western front, including baseballs, bats, masks, and footballs.

Miss Florence Doane of 18 West Thirty-fourth Street is receiving applications for tickets.

Mrs. Francis McN. Bacon, Mrs. J. Stewart Barney, Mrs. Henry P. Davison, Mrs. E. H. Harriman, Mrs. Walter E. Maynard, Mrs. Paul Morton, and Mrs. William J. Schieffelin are among the patronesses.

With Our Boys "Over There"

Since all the American forces have been placed at the disposition of General Foch, writes E. Percy Noel for the N Y. *Globe,* there has developed a great change of atmosphere in the region occupied by the Americans, which is called the intermediate zone. This is true of all the services. The word "front" is frequently repeated, but the effect of the change of policy is most noticeable on the air service. The acceleration of aviation effort is so marked that the change to activity from the condition of things a few weeks ago may be comparable to an automobile which, after running with the brakes on, is suddenly released to free movement.

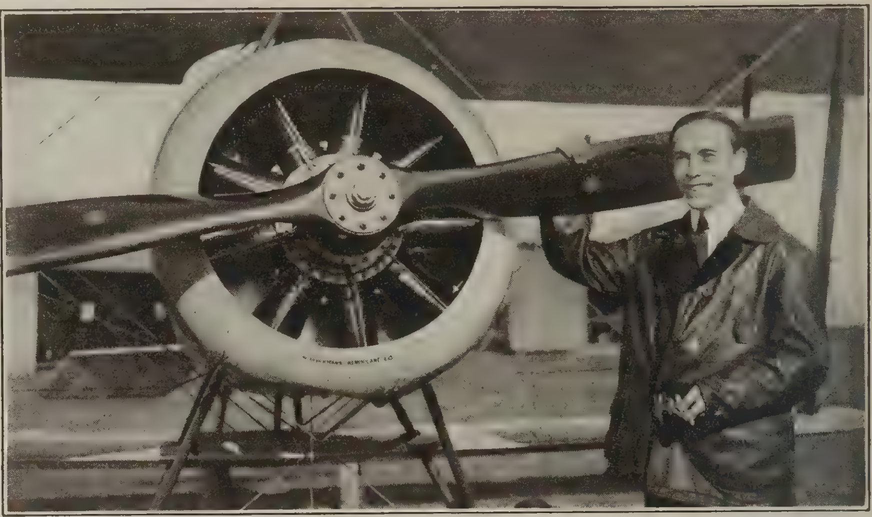
"Planes, not plans, results instead of progress," was the keynote. There and elsewhere, according to the object of the center, I found the same spirit. At an aviation industrial center which eventually will be America's largest establishment in France, great buildings of steel and corrupgated iron, had arisen Aladdin-like during the week. In one of them barely completed were tools and forges on the cindered floors. Here I heard a staff officer saying, "Our few hundred planes are on the way now and you will have to take care of them."

Returning from a reconnaissance flight, the aviator hands his films to the photographer for immediate development. (British Official Photo)

THE BERCKMANS SPEED SCOUT

By
GEORGE F. McLAUGHLIN

Description passed by the Committee on Public Information.

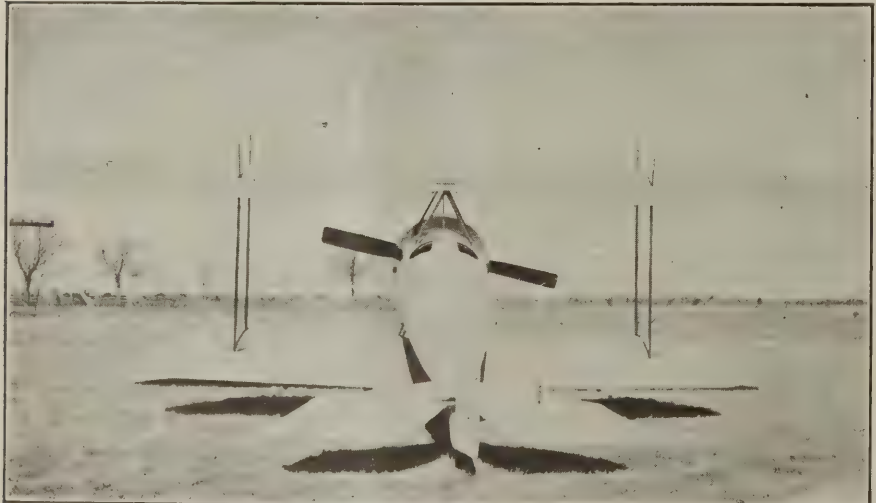


IN a great number of points, the little single-seater, designed by Maurice Berckmans, shows a marked advance in scout-building which has resulted in some performances worthy of note. In December the scout piloted by Bert Acosta ascended to 22,000 feet and returned to the earth in twenty-seven minutes. Its normal climb is 1,100 feet per minute. These figures were verified by an altimeter (indicating barometer) and two recording barographs.

Quick climbing ability is but one of the inherent features of its design. The streamline monocoque body, the reduction of exposed parts and the light total weight have assisted in the achievement of high speed. A judicious distribution of weights and areas, bringing the centers of erea, thrust, gravity and resistance in advantageous positions, has made the machine easy to control and prompt and precise in response to control movements. These attributes, together with its neat details and finish, easily distinguish the Berckmans Aeroplane Company's scout as one of the finest American machines of this type.

General Specifications

Span, upper plane	26'- 0"
Span, lower plane	19'- 0"
Chord, both planes	4'-11"
Gap	5'- 3"
Stagger	17°
Length of machine overall	18'- 0"
Heighth of machine overall	8'- 9"
Net Weight—machine empty	820 lbs.
Gross weight—machine and load	1,190 lbs.
Useful load	370 lbs.
Engine, G. V. Gnome	100 H.P.
Speed range	115-54 mph.
Climbing speed	1,100 ft. per min.
Gliding angle	8 to 1
Radius of action	2½ hrs.



REAR VIEW OF THE BERCKMANS SCOUT
Even at this close range the camouflage painting on this machine renders it semi-invisible
(Photo passed by the Censor)

Main Planes

The upper plane is in two sections with a 1° dihedral; lower plane in two 9'-6" sections with a 2° dihedral. Angle of incidence of both upper and lower planes, 2.1°; 1.5 at tips. Stagger, 17°, ammounting to 16 inches. No sweepback.

Area of the upper plane, 10.6 sq. ft.; lower plane, 77.9 sq. ft. Total supporting surface, 184.5 sq. ft. Loading, or weight carried per square foot of supporting surface, 6.4 pounds.

Wing curve, Eiffel No. 32. Ribs have ½" by 3/16" spruce battens and veneer webs. Veneer is with 3-ply birch-gum-birch, each lamination 1/16" thick. Ribs spaced along the wing 10" apart.

Leading edge and the forward main wing beam are of spruce, and the rear beam of ash (the ash being necessary because of the relatively narrow depth of the Eiffel wing section at the rear spar). The trailing edge of 20 gage aluminum tubing with an outside diameter of ⅜".

Ailerons on the upper plane only, 4'-10" in span and 1'-11" deep. The half-round leading edge is set into a curved recess in the rear wing beam, leaving no opening between these surfaces.

Interplane struts are of spruce, hollowed for lightness. The halves are glued together with fibre crossed (for avoiding warping) and bound in three places to keep them firmly in place. Maximum width, 1¼"; maximum depth (at the center), 4", tapering to 1½" at the ends. The front edge is nearly straight and the rear curved in a pronounced gradual taper.

Wiring between the planes is with flexible stranded cable; flying wires doubled and bound together to lessen resistance. The compensating control cable, from one aileron to the other, is run concealed in the upper plane. Inspection doors are located above the pulleys, where the cable ends emerge and run to the aileron king-posts.

Body

The fuselage is of the monocoque type, with a finely tapered streamline form. Its section at all points is perfectly circular; at the forward end it is 3'-0" in diameter. It is built up of 3-ply spruce, except the portion from the pilot's seat to the engine, which is 4-ply. Laminations are 1/16" thick, with coarse 1/16" mesh fabric interposed to keep the glue from shearing.

A headrest and streamline former is built onto the fuselage top aft of the cockpit.

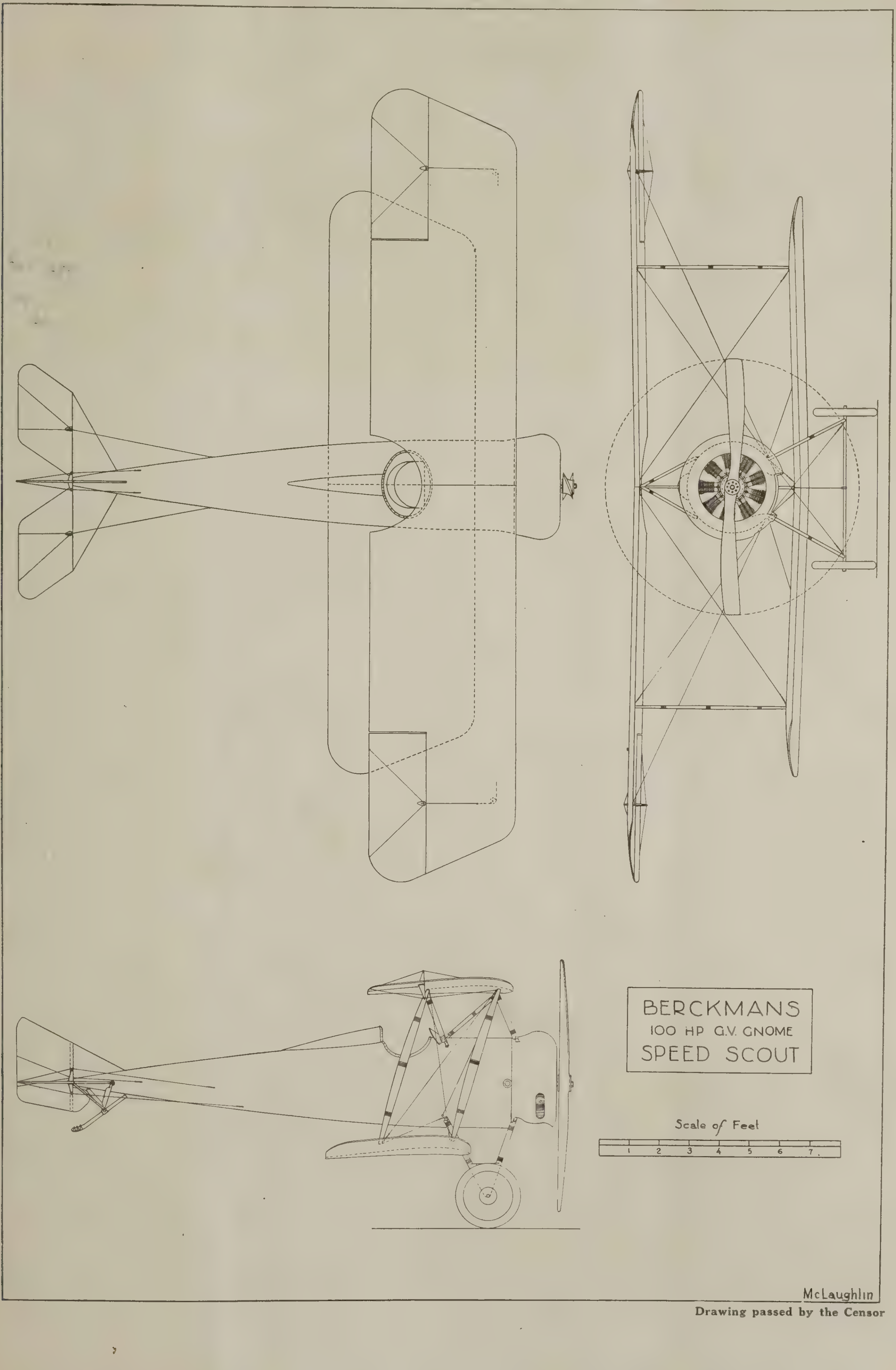
At the points where landing-gear struts and interplane flying cables are attached, the body is braced with rings of 1/16" thick U channel steel, riveted to the interior wall.

Stick control is installed; the stick for longitudinal and lateral movements, and the foot-bar for direction.

Tail Group

Light-gage Shelby steel tubing is used in the empennage construction.

(*Continued on page* 350)



Drawing passed by the Censor

(*Continued from page* 348)

The fixed tail-plane is set at a neutral angle. It is in two halves, attached to either side of the body. Overall span, 5′-9″; maximum depth, 1′-6″; area, 8 sq. ft.

Tail flaps have a span of 7′-9″ and a depth of 1′-9″; area, 9.5 sq. ft. They are recessed into the tail plane so as to leave no space between the surfaces.

The triangular vertical fin is 1′-9″ long and 1′-3″ high. Area, 2.5 sq. ft.

The rudder is of the balanced type, with the balancing portion projecting forward under the body. It is recessed into the fin and body in the same manner as the flaps and tail. Maximum height, 3′-3″; depth rearward of the rudder post, 1′-11″; balanced portion, 7″ forward of the rudder post. Rudder area, 7.5 sq. ft.

Landing Gear

Great simplicity is seen in the landing chassis construction. It consists of a pair of 26″ by 3″ Ackerman spring wheels attached to a 1½″ diameter 3/16″ wall tube axle. Wheel tread, 5′-3″.

Chassis members are 1¼″ diameter 14 gage steel tube, streamlined with spruce fairing strips. Cross-wiring of heavy flexible cable.

The tail skid is mounted on a steel tube tripod, and sprung with rubber shock-absorber elastic cord.

Power Group

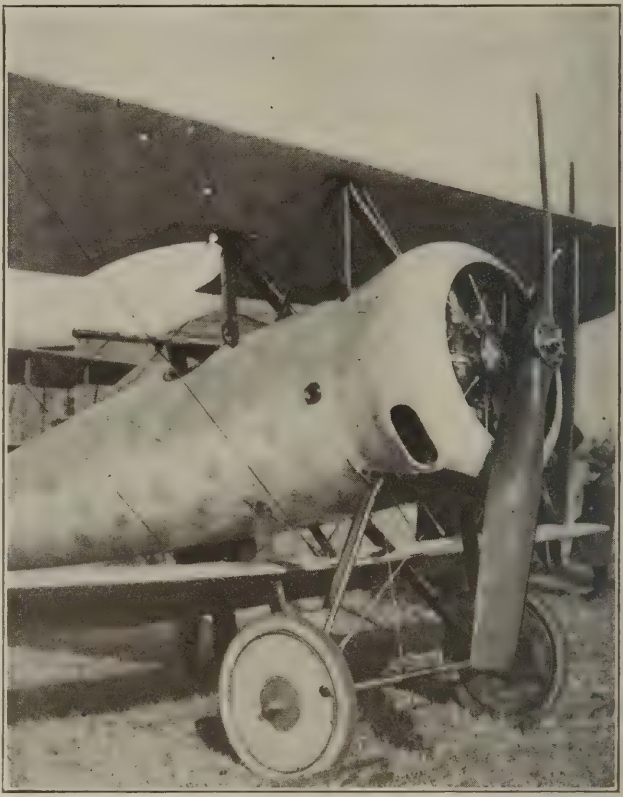
The engine is a rotary 9-cylinder General Vehicle Company's monosoupape Gnome. Bore, 110 mm; stroke, 150 mm. Rated H.P., 100 at 1,200 r.p.m. Weight, including vaporizer and ignition, 272 lbs. Fuel Consumption, 12 gallons per hour.

To assure a good supply of rich air to the vaporizer when the machine is banking or spiralling, and a vacuum liable to occur on one side of the body, two intake ducts are provided, one at either side of the body.

The propeller is 8′-4″ diameter with an 8′-9″ pitch.

The cowl surrounding the engine is of 1/16″ aluminum, reinforced with L section aluminum angle beam. An opening in the side of the cowl is made for the exhaust of the engine, and an opening at the bottom for cooling the cylinders and to facilitate removal.

Fuel is carried at either side of the fuselage interior in two 15-gallon tanks, running from the engine bulkhead to the rear of the cockpit and following the contour of the body. A 7-gallon oil tank is located at the top of the fuselage interior, just forward of the instrument board. The fuel is sufficient for a flight of 2½ hours.



Detail view of the Berckmans Scout, giving an idea of the chassis arrangement. (Passed by the Censor)

NEW AERONAUTIC BOOKS

Dictionary of Aviation

The "Dictionary of Aviation" compiled by Robert Morris Pierce, is published in a convenient, handy size, and while there have been many words written into the parlance of aeronautics since its appearance, it is a usable book, and decidedly worth its place on the desk of the aeronautical student. The attempt has been to produce a word book for the use of persons interested in aviation from any of the various points of view from which it may be contemplated. The price of the volume is $1.50.

Above the French Lines

Stuart Walcott, a young Princeton student who heard the call to arms prior to April, 1917, and who has since made the supreme sacrifice, wrote most interesting letters concerning his experiences, from the moment he started his flying tuition until shortly before the end, and these letters have been collected and issued by the Princeton Press in a small volume under the title "Above the French Lines." The letters tell in a chatty human way the life of the first band of bird men who went to France, and through it runs a vein of information which everyone going "over there" should have. Besides being instructive, the reader will find it immensely interesting.

En L' Air

War had been declared only two days between France and Germany, when Lieut. Bert Hall, then living in Paris, offered his services to France. He helped save Paris in the battle of the Marne, volunteered December 14, 1914, for aerial service, and became one of the ten original American members of the Lafayette Escadrille, of whom he and Major William Thaw are the only survivors. In August, 1916, he went to Russia and Roumania to assist these nations in connection with their air forces.

In his recently published book Lieut. Hall gives an intimate account of many experiences. Some of his descriptions of trench and air fighting are thrilling, and "En L'Air" has that atmosphere or reality that makes it a pleasure to peruse it. The price of the volume is $1.50.

Acquiring Wings

William B. Stout, pioneer aeronautic authority, now co-operating in a technical capacity with the Aircraft Board, has done the young aeronautic student a distinct service by publishing at this time his little volume "Acquiring Wings," which is couched in terms to answer the questionings of the prospective air student concerning the Why and the Wherefore of aviation. The work is written in easily understood terms, and the diagrams are particularly clear. After its perusal the reader has a very definite understanding of the theory of mechanical flight, and is well equipped to delve into more pretentious and technical works. The price of this volume is $.75.

Learning to Fly in the U. S. Army

E. N. Fales, assistant professor of mechanical engineering, chairman of aeronautics in the University of Illinois, has produced a manual of aviation practice under the title "Learning to Fly in the U. S. Army." The first chapter discusses briefly the history of aviation and subsequent chapters respectively, Types of Military Aeroplanes; Principles of Flight; Cross-country Flying; the Rigging of Aeroplanes—Nomenclature; Materials of Construction; Erecting Aeroplanes; Toning up the Fusilage; Handling of Aeroplanes. In other words, just exactly the volume of real practical value to the air student. The volume is well illustrated with half tones and line cuts. The price of the volume is $1.50.

The Way of the Air

The "spirit of the air" has often times been referred to in the daily points as something to be marvelled at, and the volume from the pen of Edgar C. Middleton, "The Way of the Air" gives many striking examples of this spirit. The author is a journalist, and consequently his pen pictures are particularly realistic; and his happy knack of making his reader experience his thrill with him makes the volume very enjoyable reading. In the latter section of the book he gives some excellent advice and suggestion to the young military airman. The price of the volume is $1.00.

THE CARWEN DYNAMIC BALANCING MACHINE

By G. DOUGLAS WARDROP

DURING the last twelve months the engineers of the Carlson-Wenstrom Company have devoted much time to the improvement of the Carwen dynamic balancing machine, which is founded on the Akimoff patents. The Akimoff patents were transferred to the Dynamic Balancing Machine Company, and the Carlson-Wenstrom Company are the exclusive licensees in the United States and important foreign countries.

The chief engineer of the Carlson-Wenstrom, **Mr. Jacob Lundgren,** is responsible for the recent improvements in the apparatus, which include a dial indicator which registers the amount of unbalance of the body; a flexible spring drive which increases the sensitiveness of the machine; a two-point balancing couple; operating the balancing couple while the machine is running; changing the relative angle of the balancing couple to an exact degree while the machine is in motion.

No matter how carefully an electric armature, automobile crankshaft, turbine rotor, centrifugal blower or separator, or the like be made, it rarely comes from the finisher's hands in perfect balance.

"Static" balance—such that the piece will remain in any position when placed on level ways—involves no great difficulty. But a body in perfect static balance may still develop a centrifugal couple leading to severe vibration at high rotative speeds.

So objectionable is this vibration with all the classes of apparatus named above, and many others, that much expense is incurred to machine non-working surfaces, and hours are spent in attempts to eliminate by trial and error the unbalanced couples, in order to minimize the ill effects of even a minute unbalance at high speeds.

Both the additional machine work and the larger part of the time thus spent are saved by the method here described.

The Carwen dynamic balancing machine determines in a few moments:

(1) The exact plane of unbalance.

(2) The exact amount of unbalance.

By applying the readings of the machine to a chart furnished with it one can determine at once exactly how much metal should be added or removed, and at what points, to produce a perfect running balance.

In repetition work, the machine will handle easily 100 automobile crankshafts or similar-sized parts in an 8-hour day; and there is absolutely no guesswork about its readings.

A man at a drill press, taking the shafts as they come tagged from the balancing machine, rapidly applies the corrections by drilling to the required depth at two points for a 4- or 8-cylinder shaft, two or sometimes three for a 6- or 12-cylinder, at a designated radius from the axis. Electric armatures, etc., are corrected almost as rapidly.

The whole process of setting in the Carwen machine, measuring the unbalance, and reading the chart, takes less than five minutes for an automobile crankshaft; and the result is better than has heretofore been obtainable with hours of careful trial.

Principle of Dynamic Balance

A body is in dynamic balance when there is no disturbing centrifugal couple acting on the axis of its rotation.

See figure 2, in which O is the common center of gravity, a the center of gravity of elements to the left, and b the center of gravity of elements to the right. The center of gravity of a and b is O; and O, being on the axis, will tend to remain stationary while the body is rotated. But a will develop a centrifugal force C measured by

$$C = \frac{W\,\Omega^2\,R}{g}$$

in which W is the weight concentrated at a, Ω is the angular velocity, R the radius of a, and g the acceleration due to gravity.

Similarly, b will develop a centrifugal force C',

$$C' = \frac{W'\,\Omega^2\,R'}{g}$$

But since the body is in static balance, $W\,R = W'\,R'$. Hence

$$C = C'$$

We therefore have two equal and opposite centrifugal forces, C and C', acting at a distance M to produce a rocking moment CM.

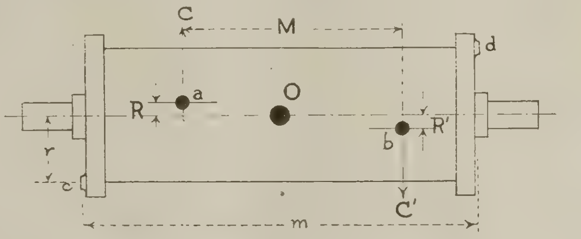
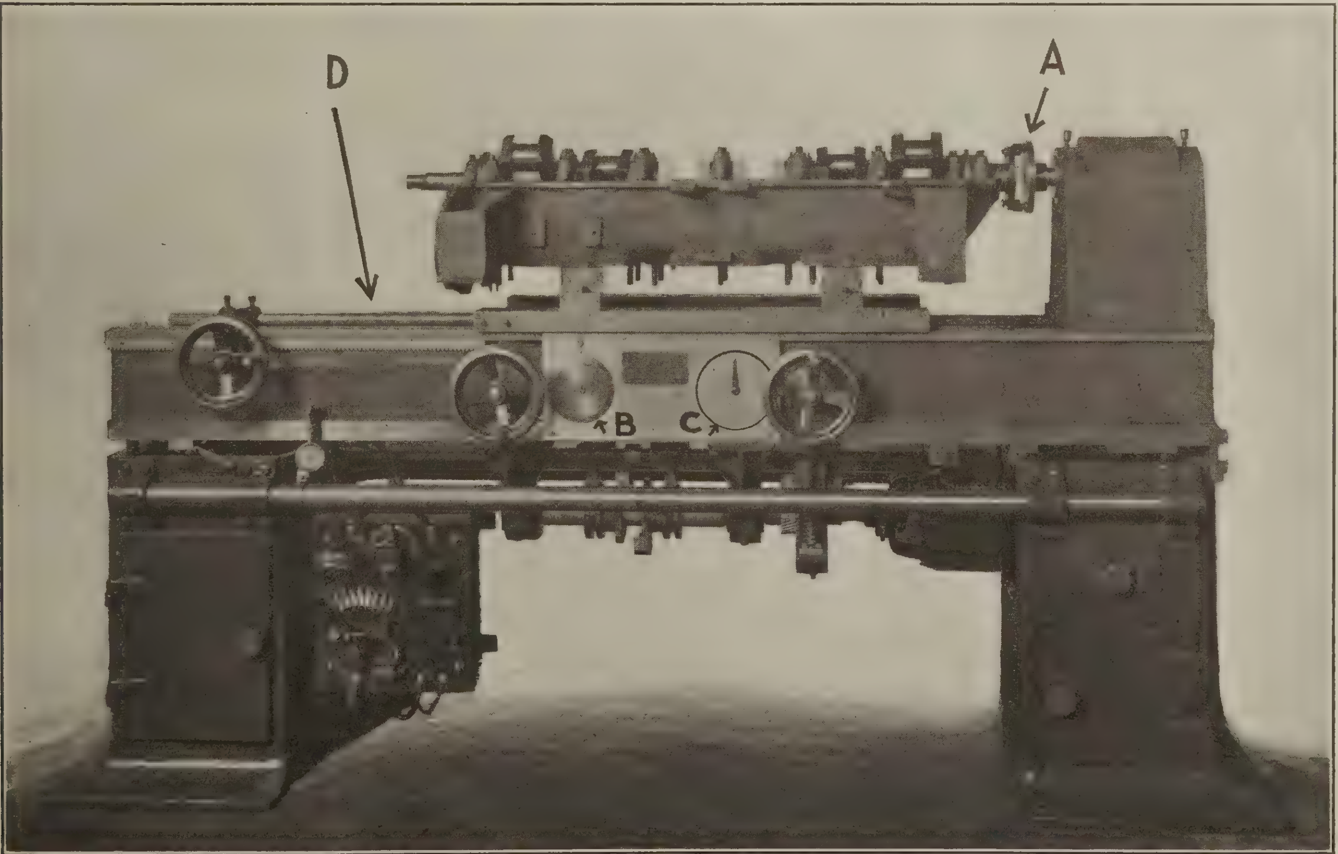


Figure 2. Body in static balance, but running unbalance. Corrective weights added at c and d.



The Carwen Dynamic Balancing Machine. A shows the connection between the driving spindle and the body to be balanced, which has a degree of flexibility, because the slightest unalignment will cause enough shock to disturb the recording of the machine. B is the dial which registers the unbalance. C is the angle dial that indicates the relative position of the balancing couple. D indicates the bed on which brackets can be erected to balance a crankshaft out of its own bearing. The bearings in the bracket are removable and so arranged that when changing from one size to another no adjustment for height or alignment is required—the center of the bearing always being in line with the center of the spindle.

To neutralize this "centrifugal couple" it is necessary to add or remove metal at two points in the plane of unbalance, such that the centrifugal couple thereby produced shall balance the other.

Suppose metal to be added at c and d. It is not necessary that the distance m between c and d shall equal M. In fact, c and d may be quite arbitrarily located, so long as they are in the proper plane; it is only necessary that the "moment," or product of m by the centrifugal force due to c, shall be equal and opposite to the moment CM.

Let us put w = weight at c, and r = radius of c, which radius likewise may be arbitrarily chosen.

Then

$$C'' = \frac{w\,\Omega^2 r}{g}$$

where C'' is centrifugal force at c.

By assumption

$$CM = C''m \text{ or}$$

$$\frac{W\,\Omega^2 R M}{g} = \frac{w\,\Omega^2 r m}{g}$$

Cancelling $\qquad WRM = wrm$

That is, *the product of one compensating weight, its radius from the axis, and the distance between the weights, must equal the corresponding product for the hidden unbalance.* Also

$$\frac{w}{W} = \frac{RM}{rm} \text{ and } w = \frac{WRM}{rm}$$

Since r and m for the added weight w are arbitrary, it follows that if we can determine $W\ R\ M$ we can immediately fix the required value of w,—in other words, the amounts of metal to be added at the prescribed radius r and at points m inches apart.

To determine $W\ R\ M$ is the function of the Carwen dynamic balancing machine.

Principle of the Carwen Machine

In the Carwen machine the object to be balanced is supported and rotated on a bed which is fixed at one end, but free to vibrate at the other in one plane only under the influence of the unbalanced moment. Below and parallel to the body under test is another shaft, suspended from the bed and turning in the same direction at the same speed. See diagram, figure 3, in which A is the object tested, B the bed, and C the second shaft. On this latter shaft are known weights $D\ D$, which may be shifted while running to produce a centrifugal couple of variable but accurately measured amount. By varying the plane of these weights, and the distance between them, a position is found in which the unbalance due to the known weights exactly neutralizes the unbalance in the object tested. When this is done the vibration ceases.

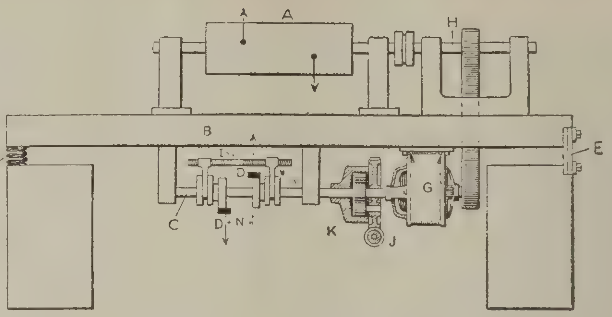


Figure 3. Principle of Carwen dynamic balancing machine. A, object under test; B, vibrating bed; C, spliced shaft carrying compensating weights D D; E, hinge; F, spring support; G, motor; H, head shaft; I, right and left hand screw; J, worm; K, internal gear of planetary drive. N, variable distance.

Under this condition the moment of the couple artificially produced by the known weights equals and neutralizes the hidden couple in the object tested; in other words, $W'\ R'\ M'$ for the compensating weights equals $W\ R\ M$.

But W' and R' for these weights are fixed, and M' (the only variable) can be directly measured. To simplify the matter still further, the product $W'\ R'\ M'$, of the weight, radius and distance apart of the weights, is arranged to be read in ounce-inches directly from the machine.

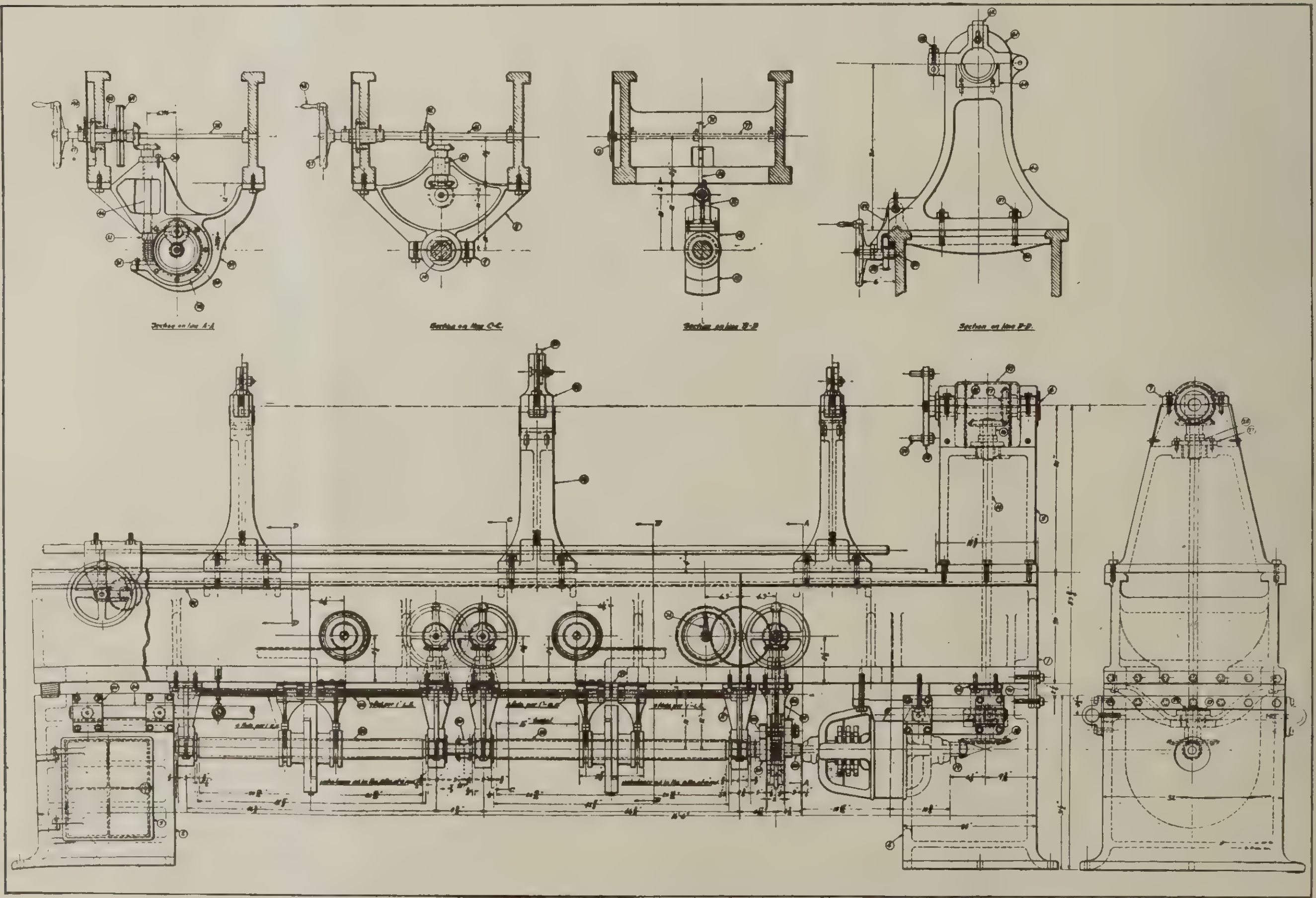
Ounce-inches, of course, vary with the speed of the machine, but so does the ounce-inches in the body to be balanced in the same proportion. The ounce-inches that the machine registers is the weight in ounces × radius and distance in inches, taken at a speed, for instance, where the centrifugal force is 1.

Since this product equals $W\ R\ M$, we have

$$w = \frac{W'R'M'}{rm}$$

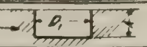
in which the product $W'\ R'\ M'$ and both factors $r\ m$ are known.

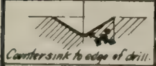
If, instead of adding weights, we drill holes in specified locations, the task is further simplified by preparing charts showing the diameter and depths of holes. Thus the man at the drill press is required only to read a tag, made out for him by the balancing machine operator or assistant, from the readings of the chart.

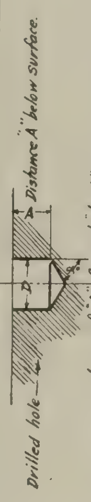


Section drawing of one of the Carwen Dynamic Balancing Machines—Type H

№ I Weights of steel in ounces or fractions thereof removed by drilling or counterboring. counterbored hole







values of "A" from 1/32" to 1 1/4"	Size of drills = D.										Size of counterbore = D₁												
	1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1	1 1/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Countersink to edge of drill.	.00068 oz	.0023 oz	.006 oz	.019 oz	.044 oz	.086 oz	.149 oz	225 oz	.368 oz	.457 oz	oz.	oz.	oz	oz	oz	oz	oz	oz.	oz	oz	oz	oz	oz.
A.																							
1/32	.00243	.0062	.01295	.03465	.0718	.1294	.2125	310	.478	.582	.007	.010875	.015625	.0213	.0278	.0434	.0625	085	.11125	.1408	.173875	2104	.250
1/16	.00418	.0101	.0199	.0503	.0996	.1728	.275	.395	.588	.707	.014	.0217	.0312	.0426	.0556	.0868	.125	.170	.2225	.2816	.34775	.42	.500
3/32	.00593	.0140	.02685	.06545	.1274	.2162	.3375	.480	.698	.832	.021	.0326	.0468	.0639	.0834	.303	.1875	.255	.3337	.4224	.521625	.63	.75
1/8	.00768	.0179	.0338	.0816	.1552	.2596	.400	.565	.808	.957	.028	.0434	.0624	.0852	.1112	.174	.25	.340	.445	.5632	.645	.84	1.00
5/32	.00943	.0218	.04075	.09725	.1830	.3030	.4625	.650	.918	1.082	.035	.0542	.078	.1065	.1390	.217	.3125	.425	.5562	.704	.8688	1.06	1.25
3/16	.01118	.0257	.0477	.1129	.2108	.3464	.525	.735	1.028	1.207	.042	.065	.0937	.1278	.1668	.260	.375	.510	.6675	.8448	1.040	1.26	1.50
7/32	.01293	.0296	.05465	.12855	.2386	.3898	.5875	.820	1.138	1.332	.049	.0758	.1093	.1491	.1946	.304	.4375	.595	.7787	.9856	1.216	1.47	1.75
1/4	.01468	.0335	.0616	.1442	.2664	.4332	.650	.905	1.248	1.457	.056	.0866	.125	.1704	.2224	.348	.5	.681	.89	1.126	1.390	1.68	2.00
9/32	.01643	.0374	.06855	.15985	.2942	.4766	.7125	.990	1.358	1.582	.063	.0978	.1406	.1917	.25	.391	.5625	.760	1.0012	1.264	1.560	1.89	2.25
5/16	.01818	.0413	.0755	.1755	.3290	.5200	.775	1.075	1.468	1.707	.07	.1087	.15625	.213	.278	.434	.625	.845	1.1125	1.267	1.738	2.1	2.50
11/32	.01993	.0452	.08245	.19115	.3498	.5634	.8375	1.160	1.578	1.832	.077	.1195	.1718	.2343	.3058	.478	.6875	.930	1.22375	1.408	1.900	2.31	2.75
3/8	.02168	.0491	.0894	.2068	.3776	.6068	.900	1.245	1.688	1.957	.084	.1303	.1875	.2556	.3336	.522	.75	1.02	1.335	1.548	2.086	2.52	3.00
13/32	.02343	.0530	.09635	.22245	.4054	.6502	.9625	1.330	1.798	2.082	.091	.1411	.203	.2769	.3614	.565	.8125	1.105	1.4462	1.689	2.26	2.73	3.25
7/16	.02518	.0569	.1033	.2381	.4332	.6936	1.025	1.415	1.908	2.207	.098	.1519	.2187	.2982	.3892	.608	.875	1.195	1.5575	1.829	2.43	2.94	3.50
15/32	.02693	.0608	.11025	.25375	.4610	.7370	1.0875	1.500	2.018	2.332	.105	.1627	.2343	.3195	.417	.652	.9375	1.280	1.6687	1.97	2.600	3.15	3.75
1/2	.02868	.0647	.1172	.2694	.4888	.7804	1.150	1.585	2.128	2.457	.112	.1735	.250	.3408	.4448	.696	1.00	1.365	1.78	2.111	2.78	3.36	4.00
17/32	.03043	.0686	.12415	.28505	.5166	.8238	1.2125	1.670	2.238	2.582	.119	.1843	.2656	.3621	.4726	.739	1.0625	1.45	1.8912	2.252	2.95	3.57	4.25
9/16	.03218	.0725	.1311	.3007	.5444	.8672	1.275	1.755	2.348	2.707	.126	.1951	.2812	.3834	.500	.783	1.125	1.535	2.0025	2.393	3.130	3.78	4.50
19/32	.03393	.0764	.13805	.31635	.5722	.9106	1.3375	1.840	2.458	2.832	.133	.206	.2968	.4047	.5278	.827	1.1875	1.62	2.1137	2.533	3.300	3.99	4.75
5/8	.03568	.0803	.1450	.3320	.6000	.9540	1.40	1.925	2.568	2.957	.146	.2168	.3125	.4260	.5560	.870	1.25	1.705	2.2262	2.674	3.477	4.30	5.00
21/32	.03743	.0842	.15195	.34765	.6278	.9974	1.4625	2.010	2.678	3.082	.147	.2276	.3281	.4473	.5834	.9134	1.3125	1.79	2.3375	2.815	3.650	4.41	5.25
11/16	.03918	.0881	.1589	.3633	.6556	1.0408	1.525	2.095	2.788	3.207	.154	.2384	.3437	.4686	.6112	.9568	1.375	1.875	2.4437	2.956	3.820	4.63	5.50
23/32	.04093	.0920	.16585	.37895	.6834	1.0842	1.5875	2.180	2.898	3.332	.161	.250	.3593	.4899	.639	1.00	1.4375	1.959	2.560	3.238	4.00	4.84	5.75
3/4	.04268	.0959	.1728	.3946	.7112	1.1276	1.65	2.265	3.008	3.457	.167	.261	.375	.511	.667	1.043	1.5	2.044	2.67	3.379	4.173	5.049	6.00
13/16	.04618	.1037	.1857	.4259	.7668	1.2144	1.775	2.435	3.228	3.707	.181	.283	.406	.553	.722	1.129	1.625	2.214	2.892	3.659	4.520	5.469	6.50
7/8	.04968	.1115	.1976	.4572	.8224	1.3012	1.90	2.605	3.448	3.957	.195	.294	.4372	.595	.778	1.215	1.750	2.384	3.115	3.94	4.867	5.89	7.00
15/16	.05318	.1193	.2105	.4885	.8780	1.388	2.025	2.775	3.668	4.207	.209	.226	.4684	.637	.834	1.301	1.875	2.554	3.337	4.22	5.214	6.31	7.50
1	.05668	.1271	.2234	.5198	.9336	1.4748	2.150	2.945	3.888	4.457	.223	.348	.500	.681	.889	1.39	2.000	2.72	3.56	4.505	5.564	6.73	8.00
1 1/16	.06018	.1349	.2336	.5511	.9892	1.5616	2.275	3.115	4.108	4.707	.237	.369	.5312	.723	.944	1.476	2.125	2.89	3.7825	4.785	5.91	7.15	8.50
1 1/8	.06368	.1427	.2492	.5824	1.0448	1.6484	2.40	3.285	4.328	4.957	.254	.391	.5624	.765	1.000	1.562	2.250	3.06	4.005	5.065	6.258	7.51	9.00
1 3/16	.06718	.1505	.2621	.6137	1.1004	1.7352	2.525	3.455	4.548	5.207	.268	.413	.5936	.807	1.056	1.648	2.375	3.23	4.2275	5.345	6.606	7.99	9.50
1 1/4	.07068	.1583	.2750	.6450	1.1560	1.822	2.65	3.625	4.768	5.457	.282	.4348	.6248	.850	1.111	1.734	2.500	3.4	4.45	5.625	6.952	8.41	10.00

Chart for finding weight of metal removed by drilling

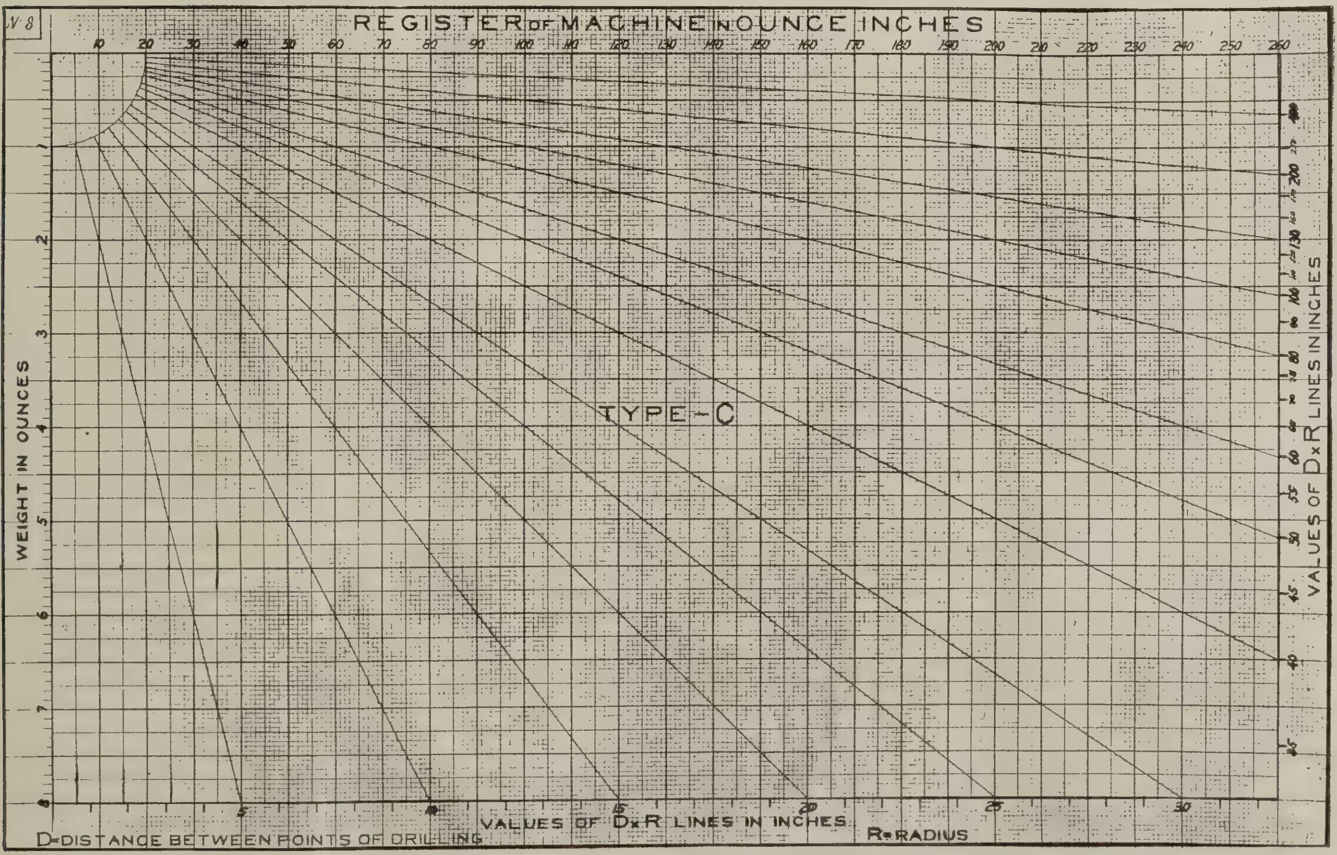


Chart for finding weight required in correcting unbalance

The compensating weights on the lower shaft are shifted to neutralize and thereby measure the unbalance in the object under test. By turning the two lower hand-wheels these weights are shifted without stopping the machine. Unbalance is read directly in ounce-inches from the semi-circular dial behind the left hand-wheels.

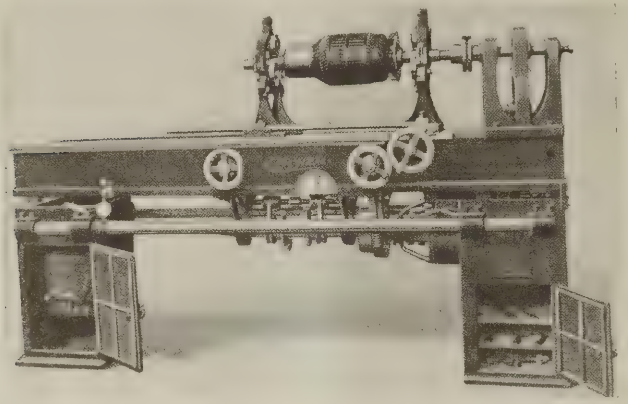


Figure 4. Carwen balancing machine, ready to test electric armature.

It might at first thought appear that the correct performance of the machine would require the centers of gravity of the object tested and of the counterbalancing weights to be located one above the other; but such is not the case. As a matter of fact, these centers of gravity may be anywhere within the capacity of the vibrating bed; and the fulcrum or hinge *E* on which the bed vibrates, instead of being located somewhere near the center, is located at the extreme right-hand end. All that is necessary is that the *moments* of the unbalanced object and the compensating weights shall be equal and opposite. These moments, acting about a common fulcrum (the hinge), produce the same effect, regardless of the exact location of the object or the compensating weights.

Construction of the Machine

The bed, which somewhat resembles a lathe bed, is supported on two box pedestals. At the right end is the "hinge"—two heavy plates of spring steel, bolted to the bed and to the pedestal. At the other end the bed rests merely one one or more short helical springs *F*, and is confined to vertical motion by a steadying strip of steel. See figure 5. The bed has no other connection with the pedestals.

Suspended from the bed is an electric motor, which drives the head shaft *H* through a train of gears. This shaft drives the object under test through a flexible coupling.

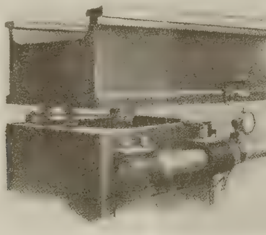


Figure 5. Left end of bed, showing spring supports, vibration indicator, and steadying strip which prevents lateral vibration. For heavier weights more springs are used. The finger lever at left of indicator is raised to touch the bed and thereby check vibrations.

Suspended in line with the motor is a shaft *C*, on which are splined the two compensating weights *D D*, connected to flanged collars through which a pair of forks moves them away from or toward each other. The left hand-wheel, through a pair of mitre gears, rotates the right and left hand screw *I* which moves the forks. The right-hand fork carries a rack from which a pinion actuates the index finger on the semi-circular dial, showing the distance between the weights. Fractional readings are taken from the dial behind the left hand-wheel. Readings are in ounce-inches, signifying the product of the weight in ounces of one counterweight, the radius of its center of gravity from the shaft axis, and the horizontal distance between the counter weight centers.

To permit the angular position of the compensating weights to be varied without stopping the machine, the shaft *C* carrying the weights is not coupled directly to the motor shaft, but is driven through a planetary gear. A spur pinion on the motor shaft meshes with a pinion carried by a cage, and this pinion engages an internal gear *K* on shaft *C*. The cage has a worm gear cut on the periphery, and by turning the lower right hand-wheel the cage is rotated, thereby changing the angular position of the counterweight shaft.

A dial angle indicator on the right side is connected with this wheel, showing the relative angle of the couple to the body being balanced.

The arrangement in figure 3 is merely diagrammatic, but shows the principle.

The gearing is such that both the test object and the counterweight shaft rotate in the same direction and at the same speed. A high speed is not necessary, as the machine is extremely sensitive. About 450 r. p. m. is usually enough, though the motor will give lower and higher speeds.

The amount of vibration is indicated by the micrometer indicator attached between the left end of the bed and the front bar joining the pedestals. To stop the vibrations quickly, the small finger lever is raised till it touches the bed.

The upper right hand-wheel is removable, and may be attached to either of the work supports for the purpose of shifting them on the bed.

Procedure When Testing

The first step in testing, after setting the piece to be tested, is to offset the compensating weights by some small distance and then use the lower right hand-wheel to vary the plane of the weights till the position of the least vibration is found.

Using the left hand-wheel, the weights are now shifted in and out, and the micrometer indicator watched. When the minimum vibration —now very small—is found, the other hand-wheel is again used for a final correction on the angular plane. The machine will now run perfectly smooth.

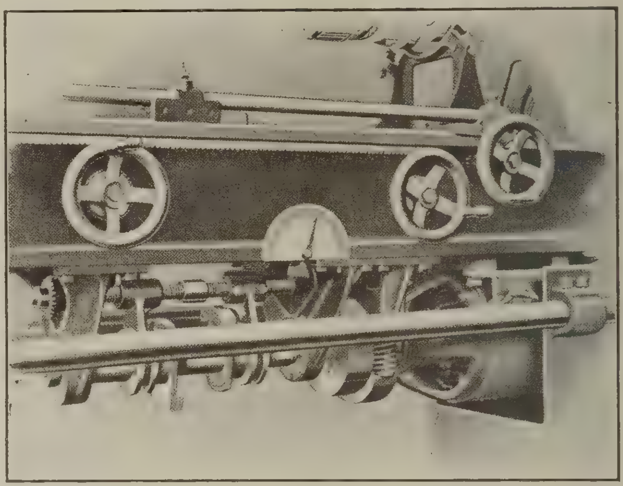


Figure 6. Details of Carwen Dynamic Balancing Machine.

Stopping with the counterweights vertical (indicated by marks on *K*), the plane of unbalance is marked on the object, and the readings are taken from the semi-circular and left hand-wheel dials and entered on a tag.

General Notes on Balancing

Throughout the foregoing it has been assumed that the piece to be balanced has already been put in static balance. This is essential, as static and dynamic balancing are entirely different processes. We furnish a simple machine by which the static unbalance can readily be measured.

Since the piece is already in static balance, which balance must not be altered, it follows that the weights added or deducted on each of the axis are equal if their radii are equal. In other words, the holes will be of equal diameter and depth.

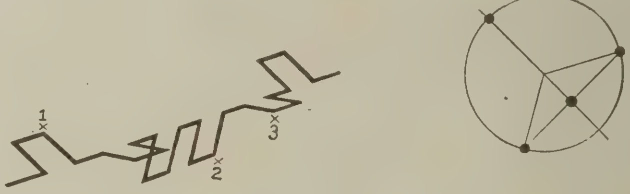
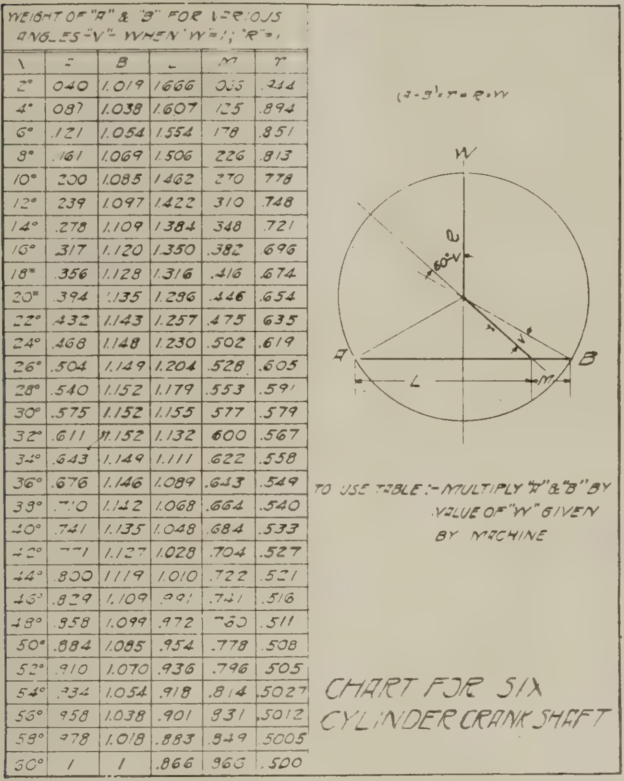


Figure 7. Principle of balancing 6-throw shaft where unbalance lies in plane of crank 1.

A special case is presented by six-cylinder crankshafts, which require correction in three planes instead of one, if the plane of unbalance lies in the line of one of the crank planes. The solution, however, is very simple. While one of the cranks in this plane may be drilled, the other cannot, since it is on the same side of the axis. It is therefore necessary to drill two other cranks, one in each of the other planes. For this purpose two adjacent cranks are chosen, and each is drilled to the same size, depth and radius as the first crank. See figure 7. The reason is that the center of gravity of these two latter holes is midway between them, at a distance from the shaft axis exactly one-half the radius of the holes (cosine 60° = .5). Thus the two holes have the same effect as one at the full radius; and, moreover, they are so spaced as not to upset the static balance in relation to hole No. 1. The moment, of course, is figured from No. 1 hole to a plane midway between the transverse planes of holes Nos. 2 and 3.

In some cases where the plane of unbalance falls between any of the crank cheeks and the corrections must be made somewhere outside the line of the plane of unbalance, the following chart will help determine (Blueprint No. 3) the amount of metal to be removed, and where, which in this case would be in four different points, two of those points falling in the same crank, weight necessary for correction would be calculated the same as if the unbalance fell in the center of one of the cranks. This valve obtained then to be multiplied with *A* and *B* for the angle *V* between the center of the crank and the plane of unbalance. The other two points at *A* and *W* would be obtained in the same way for an angle equal to 60° minue *V*. The distance between the point of correction in this case would be the mean distance between *A* and *B* to the mean distance between *A* and *W*. The radius where the corrections are made would remain the same as the radius used in the first calculation.

To facilitate rapid handling of duplicate objects two roller bearing supports are provided, as shown. To change the piece tested it is only necessary to release the top roller. A special drive is furnished for connecting to flanged crank shafts, which ensures flexibility to allow for slight variations in alignment but prevents back lash.



WEIGHT OF "A" & "B" FOR VARIOUS ANGLES "V" WHEN "W"=1; "R"=1

V	A	B	L	M	T
2°	040	1.019	1666	035	.944
4°	087	1.038	1.607	125	.894
6°	.121	1.054	1.554	178	.851
8°	.161	1.069	1.506	226	.813
10°	200	1.085	1462	270	778
12°	239	1.097	1.422	310	.748
14°	.278	1.109	1384	348	.721
16°	.317	1.120	1.350	.382	.696
18°	.356	1.128	1.316	.416	.674
20°	.394	1.135	1.296	.446	.654
22°	.432	1.143	1.257	.475	635
24°	.468	1.148	1.230	.502	.619
26°	.504	1.149	1.204	.528	.605
28°	.540	1.152	1.179	.553	.591
30°	.575	1.152	1.155	577	.579
32°	.611	1.152	1.132	600	.567
34°	.643	1.149	1.111	.622	.558
36°	.676	1.146	1.089	.643	.549
38°	.710	1.142	1.068	.664	.540
40°	.741	1.135	1.048	.684	.533
42°	771	1.127	1.028	.704	.527
44°	.800	1119	1.010	.722	.521
46°	.829	1.109	.991	.741	.516
48°	.858	1.099	.972	.760	.511
50°	.884	1.085	.954	.778	.508
52°	.910	1.070	.936	.796	505
54°	.934	1.054	.918	.814	.5027
56°	958	1.038	.901	831	.5012
58°	978	1.018	.883	.849	.5005
60°	1	1	.866	966	.500

TO USE TABLE:- MULTIPLY "A" & "B" BY VALUE OF "W" GIVEN BY MACHINE

CHART FOR SIX CYLINDER CRANK SHAFT

Operation

The body to be balanced should first of all be put in static balance; that is, when the same is put on level ways, it should be at rest in any position. To obtain perfect running or dynamic balance, it is very important to have correct static balance. If the machine fails to register the dynamic unbalance properly, it is due to poor static balance. After correcting for static balance, put body in the balancing machine and regulate speed until vibrations become uniform—if there are no vibrations, the body is in balance—offset the balancing weights a small distance with the left hand-wheel and turn the right hand-wheel until the minimum vibrations are recorded which shows that the angular plane of unbalance is found, then shift the weights in either direction with the left hand-wheel until the micrometer dial becomes stationary, when the unbalance indicator will show the amount in measures marked on the face of the dial (for *C* machine, ounce-inches or ctm. kg.)—on the disc at the right end of the balancing cage are two lines opposite each other, one plain, and one marked *O* when stopping the machine on the *O* line metal is to be *removed* on top towards right, and bottom towards left in correcting unbalance. When stopping machine on plain line, metal is to be *added* for correspecting in same places.

The weight required to correct the unbalance is obtained as follows:

if S = Register of unbalance in ounce inches
D = Distance in inches between points where correction is made
R = Radius in inches, point of correction to center of body
W = Weight required in ounces,

$$\text{then } W = \frac{S}{D \times R}$$

As $D \times R$ in most cases can be made a constant for each type of bodies to be balanced, this factor is represented by straight lines converging to the center in the upper left-hand corners of 'the charts furnished, the top figures indicate the register of the machine, and the figures on the left indicate the necessary weight where the two intersect the line representing the value of $D \times R$.

As an illustration on "C" chart.

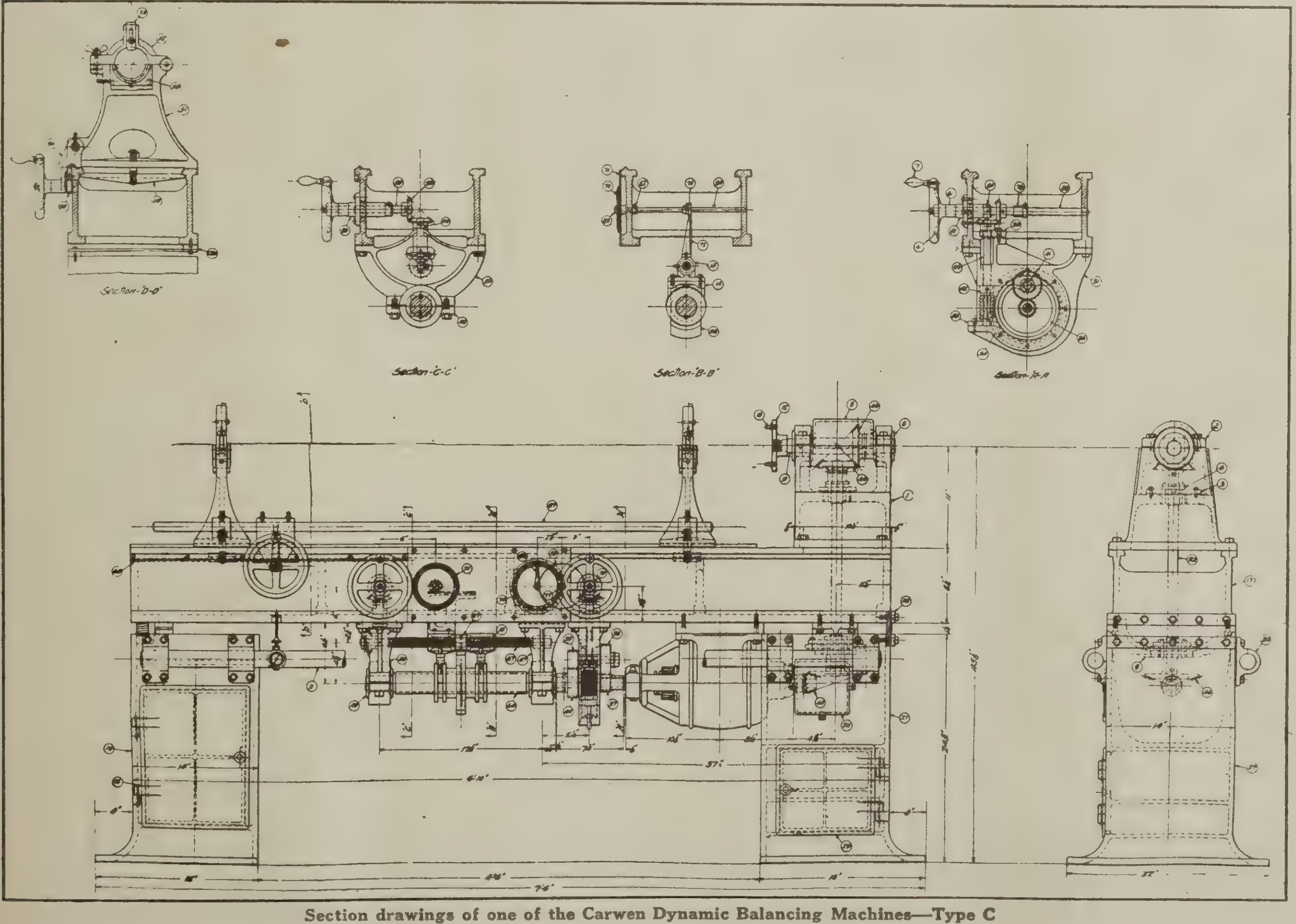
$$\left.\begin{array}{l}\text{The radius R} = 3\\ \text{Distance} \quad\;\; = 5\end{array}\right\} D \times R = 15''$$

Register of machine—60 ounce inches.

Follow 60 from top of chart until the 15" line is reached. The figure on the left opposite intersection is 4, the weight required to correct the unbalance.

Standard sizes of Carwen Dynamic Balancing Machines are built to handle objects of the following dimensions:

Type	Approx. Weight in Lbs. Handled	Capacity of Unbalance	L'ngth of Bed	Width of Bed	Largest Length Handled	Swing	Floor Space
AAA	¼ to ¾	½ oz.-inches	7"	2"	4"	2"	15"x18"
AA	¾ to 3 lbs.	4 oz.-inches	10"	3"	7"	3½"	15"x15"
A	3 to 10 lbs.	18 oz.-inches	18"	4"	14"	5"	20"x20"
B	10 to 30 lbs.	64 oz.-inches	30"	8"	24"	8"	36"x14"
C	30 to 125 lbs.	288 oz.-inches	6' 10"	14"	5'	20"	7' 6"x22"
D	125 to 500 lbs.	360 oz.-inches	7' 2"	14"	5' 6"	22"	7' 10"x22"
E	500 to 1200 lbs.	192 lb.-inches	8' 6"	16"	7'	24"	9' 2"x24"
F	1200 to 3000 lbs.	480 lb.-inches	11'	22"	9' 4"	26"	11' 7"x30"
G	3000 to 6500 lbs.	1052 lb.-inches	14'	26"	G-12'	36"	14' 7"x34"
H	6500 to 14,000 lbs.	1920 lb.-inches	17'	32"	H-15'	60"	17' 8"x40"



Section drawings of one of the Carwen Dynamic Balancing Machines—Type C

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications in addition to those concluded on page 161.

Specifications for Mercerized Cotton Aeroplane Fabric (Grade A)
(2F1 April, 1918)

General.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

Material.—2. (*a*) The warp and filling yarns used in the manufacture of this fabric must be size 2/60, according to the English cotton yarn numbers. A tolerance of plus or minus four (±4) will be allowed in the size of single yarns.

(*b*) The length of the staple of the fabric must not be less than 1½ inches.

Manufacture.—3. (*a*) The yarn shall be combed (single or double) and shall be mercerized under tension.

(*b*) It is recommended that the single yarn be given 28 to 34 turns per inch of twist and that 16 turns per inch be used for twisting these yarns together. This procedure may be altered provided that the fabric conforms to this specification in other respects.

(*c*) There must be at least 80 threads and not more than 84 threads per inch in both warp and filling.

(*d*) The weave shall be plain weave.

(*e*) The fabric must be uniform in structure and free from manufacturing imperfections.

(*f*) The fabric, under normal moisture conditions, must not weigh more than 4.5 ounces per square yard.

(*g*) The width must be 36 inches.

Physical Properties and Tests.—4.—*Tensile Test.*—(*a*) The tensile test specimens, prepared in accordance with paragraphs 5(*a*), 5(*b*), and 5(*c*), shall be exposed for at least two hours in an atmosphere of 65 per cent relative humidity at 70° F. (21° C.) and then tested in this atmosphere.

(*b*) The distance between the jaws or clamps of the testing machine at the beginning of the test shall be 8 inches (20 cm.). The pulling jaw shall move at the rate of 12 inches per minute during the test.

(*c*) The average breaking load of the five specimens cut in the direction of the warp and the average breaking load of the five specimens cut in the direction of the filling, as shown in Fig. 1, must each be at least 80 pounds.

(*d*) The elongation shall be observed when the specimens are subjected to each of the loads given in Table 1.

(*e*) Whenever practicable, an autographic record shall be taken.

(*f*) The elongation must not exceed the values given in Table 1 by more than 10 per cent.

(*g*) The average results for both warp and filling shall be reported separately.

Table 1.

Tension in pounds.	Elongation in inches, warp.	Elongation in inches, filling.
10	0.65	0.32
20	.80	.40
70	1.20	.64

Test for Sizing.—(*h*) Tests for sizing shall be conducted as follows:

(1) Dry samples weighing approximately 0.18 ounce (5 gm.) in tared weighing bottles at 221 to 230° F. (105 to 110° C.) to constant weight.

(2) Boil the samples in water for 10 minutes and rinse thoroughly.

(3) Digest each sample in a solution containing 15 centimeters commercial diastofor in 500 centimeters water at 140° F. (60° C.) for two hours.

(4) Wash thoroughly in hot water and then boil for one hour in 500 centimeters distilled water and wash again.

(5) Dry in tared weighing bottles to constant weight.

(6) Percentage sizing $= \dfrac{\text{loss in weight}}{\text{original weight}} \times 100.$

(*i*) The fabric must not contain more than 3.5 per cent of sizing, as determined by the above method.

Mercerization Test.—(*j*) Take approximately one-fourth square foot of the cloth, immerse in boiling distilled water and stir occasionally while cooling. At the end of of 10 minutes place a strip of blue and a strip of red litmus paper into the liquid with the fabric and allow them to remain 5 minutes. At the end of this time the litmus papers must have retained their original colors. Any cloth showing either an acid or alkaline reaction shall be rejected. This test may be made on the yarn before weaving by substituting a small handful of the yarn for the cloth sample.

Selection of Test Specimens.—5. (*a*) Samples for tests shall be taken from at least five bolts in each warp woven.

(*b*) The sample taken from a bolt shall be 1 yard long and the full width of the bolt; it shall be cut from the fabric at a point 10 yards from the end of the bolt.

(*c*) Test specimens for tensile tests, 12 inches long and 1¼ inches wide, shall be cut from each sample taken as shown in Fig. 1. Threads shall be pulled out from the sides of the test specimens until a width of 1 inch of woven fabric remains.

Inspection and Rejection.—6. The inspector shall mark all accepted material close to the end of each bolt with the official acceptance stamp. Rejected material shall be marked with the rejection stamp and shall not be resubmitted without the express consent of the purchaser. The acceptance and rejection stamps shall be so placed that they do not injure the material, or, in the case of rejected fabric, so that the marking does not preclude the use of the material for other than aircraft work.

Replacements.—7. All fabric that does not conform to this specification shall be rejected and shall be replaced by the manufacturer at his expense.

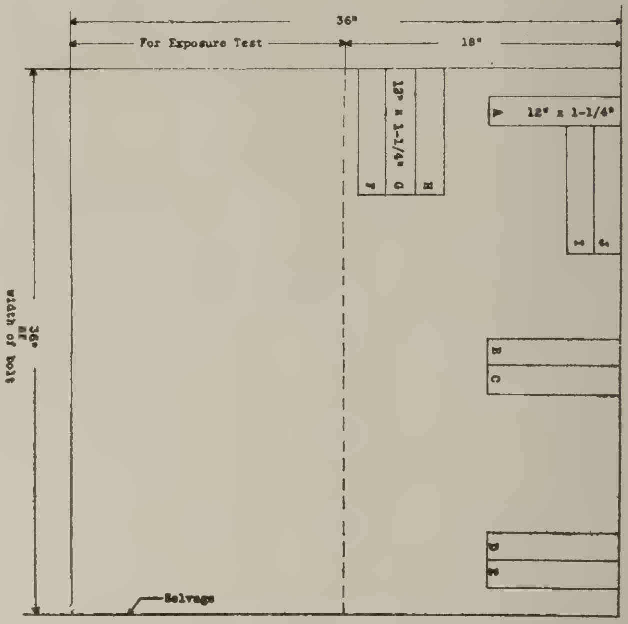


Fig. 1.—*Sketch showing the location of the 10 test specimens (lettered A to F) to be cut from the sample.*

Specifications for Unmercerized Cotton Aeroplane Fabric (Grade A)
(2F2 April, 1918)

General.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

Material.—2. (*a*) The warp and filling yarns used in the manufacture of this fabric must be size 2/60, according to the English cotton-yarn numbers. A tolerance of plus or minus four (±4) will be allowed in the size of single yarns.

(*b*) The length of the staple of the fabric must not be less than 1½ inches.

Manufacture.—3. (*a*) The yarn shall be combed (single or double).

(*b*) It is recommended that single yarn be given 22 to 25 turns per inch of twist and that 25 to 26 turns per inch be used for twisting this yarn together. This procedure may be altered provided that the fabric conforms to this specification in other respects.

(*c*) There must be at least 93 threads per inch in warp and 86 threads per inch in filling. A tolerance of plus or minus two (±2) threads will be allowed.

(*d*) The weave shall be a plain weave.

(*e*) The fabric must be uniform in structure and free from manufacturing imperfections.

(*f*) The fabric, under normal moisture conditions, must not weigh more than 4.5 ounces per square yard.

(*g*) The width must be 36 inches.

Physical Properties and Tests.—4.—*Tensile Test.*—(*a*) The tensile test specimens, prepared in accordance with paragraphs 5 (*a*), 5 (*b*), and 5(*c*), shall be exposed for at least two hours in an atmosphere of 65 per cent relative humidity at 70° F. (21° C.) and then tested in this atmosphere.

(*b*) The distance between the jaws or clamps of the testing machine at the beginning of the test shall be 8 inches (20 cm.). The pulling jaw shall move at the rate of 12 inches (30 cm.) per minute during the test.

(*c*) The average breaking load of five specimens cut in the direction of the warp and the average breaking load of the five specimens cut in the direction of the filling, as shown in Fig. 1, must each be at least 75 pounds.

(*d*) The elongation shall be observed when the specimens are subjected to each of the loads given in Table 1.

(*e*) Whenever practicable an autographic record shall be taken.

(*f*) The elongation must not exceed the values given in Table 1 by more than 10 per cent.

(*g*) The average results for both warp and filling shall be reported separately.

Table 1.

Tension in pounds.	Elongation in inches, warp.	Elongation in inches, filling.
10	0.74	0.42
20	.94	.53
70	1.44	.90

Test for Sizing.—(*h*) Tests for sizing shall be conducted as follows:

(1) Dry samples weighing approximately 0.18 ounce (5 gm.) in tared weighing bottles at 221 to 230° F. (105 to 110° C.) to constant weight.

(2) Boil the samples in water for 10 minutes and rinse thoroughly.

(3) Digest each sample in a solution containing 15 cubic centi-

meters commercial diastofor in 500 cubic centimeters water at 140° F. (60° C.) for two hours.

(4) Wash thoroughly in hot water and then boil for one hour in 500 cubic centimeters distilled water and wash again.

(5) Dry in tared weighing bottles to constant weight.

(6) Percentage sizing $= \frac{\text{loss in weight}}{\text{original weight}} \times 100.$

(*i*) The fabric must not contain more than 3.5 per cent of sizing, as determined by the above method.

Selection of Test Specimens.—5. (*a*) Samples for tests shall be taken from at least five bolts in each warp woven.

(*b*) The sample taken from a bolt shall be 1 yard long and the full width of the bolt; it shall be cut from the fabric at a point 10 yards from the end of the bolt.

(*c*) Test specimens for tensile tests, 12 inches long and 1¼ inches wide, shall be cut from each sample taken as shown in Fig. 1. Threads shall be pulled out from the sides of the test specimens until a width of 1 inch of woven fabric remains.

Inspection and Rejection.—6. The inspector shall mark all accepted material close to the end of each bolt with the official acceptance stamp. Rejected material shall be marked with the rejection stamp and shall not be resubmitted without the express consent of the purchaser. The acceptance and rejection stamps shall be so placed that they do not injure the material, or, in the case of rejected fabric, so that the marking does not preclude the use of the material for other than aircraft work.

Replacements.—7. All fabric that does not conform to this specification shall be rejected and shall be replaced by the manufacturer at his expense.

Specifications for Mercerized Cotton Aeroplane Fabric (Grade B)
(2F3 April, 1918)

General.—1. (*a*) The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

Material.—2. The warp and filling yarns used in the manufacture of this fabric must be size 3/80, according to the English cotton yarn numbers. A tolerance of plus or minus four (±4) will be allowed in the size of single yarns.

(*b*) The length of the staple of the fabric must not be less than 1½ inches.

Manufacture.—3. (*a*) The yarn shall be combed (single or double) and shall be mercerized under tension.

(*b*) It is recommended that the single yarn be given 36 to 40 turns per inch of twist and that 18 to 20 turns per inch be used for twisting these yarns together. This procedure may be altered, provided that the fabric conforms to this specification in other respects.

(*c*) There must be at least 68 threads and not more than 72 threads per inch in both warp and filling.

(*d*) The weave shall be a plain weave.

(*e*) The fabric must be uniform in structure and free from manufacturing imperfections.

(*f*) The fabric, under normal moisture conditions, must not weigh more than 4 ounces per square yard.

(*g*) The width must be 36 inches.

Physical Properties and Tests.—4.—*Tensile Test.*—(*a*) The tensile test specimens, prepared in accordance with paragraphs 5 (*a*), 5 (*b*), and 5(*c*), shall be exposed for at least two hours in an atmosphere of 65 per cent relative humidity at 70° F. (21° C.) and then tested in this atmosphere.

(*b*) The distance between the jaws or clamps of the testing machine at the beginning of the test shall be 8 inches (20 cm.). The pulling jaw shall move at the rate of 12 inches per minute during the test.

(*c*) The average breaking load of the five specimens, cut in the direction of the warp and the average breaking load of the five specimens cut in the direction of the filling, as shown in Fig. 1, must each be at least 73 pounds.

(*d*) The elongation shall be observed when the specimens are subjected to each of the loads given in Table 1.

(*e*) Whenever practicable an autographic record shall be taken.

(*f*) The elongation must not exceed the values given in Table 1 by more than 10 per cent.

(*g*) The average results for both warp and filling shall be reported separately.

Table 1.

Tension in pounds.	Elongation in inches, warp.	Elongation in inches, filling.
10	0.70	0.44
20	.86	.52
65	1.19	.78

Test for Sizing.—(*h*) Tests for sizing shall be conducted as follows:

(1) Dry samples weighing approximately 0.18 ounce (5 gm.) in tared weighing bottles at 221 to 230° F. (105 to 110° C.) to constant weight.

(2) Boil the samples in water for 10 minutes and rinse thoroughly.

(3) Digest each sample in a solution containing 15 cubic centimeters commercial diastofor in 500 cubic centimeters water at 140° F. (60° C.) for two hours.

(4) Wash thoroughly in hot water and then boil for one hour in 500 cubic centimeters distilled water and wash again.

(5) Dry in tared weighing bottles to constant weight.

(6) Percentage sizing $= \frac{\text{loss in weight}}{\text{original weight}} \times 100.$

(*i*) The fabric must not contain more than 3.5 per cent of sizing, as determined by the above method.

Mercerization Test.—(*j*) Take approximately one-fourth square foot of the cloth, immerse in boiling distilled water, and stir occasionally while cooling. At the end of 10 minutes place a strip of blue and a strip of red litmus paper into the liquid with the fabric and allow them to remain 5 minutes. At the end of this time the litmus papers must have retained their original colors. Any cloth showing either an acid or alkaline reaction shall be rejected. This test may be made on the yarn before weaving by substituting a small handful of the yarn for the cloth sample.

Selection of Test Specimens.—5. (*a*) Samples for tests shall be taken from at least five bolts in each warp woven.

(*b*) The sample taken from a bolt shall be 1 yard long and the full width of the bolt; it shall be cut from the fabric at a point 10 yards from the end of the bolt.

(*c*) Test specimens for tensile tests, 12 inches long and 1¼ inches wide, shall be cut from each sample taken, as shown in Fig. 1. Threads shall be pulled out from the sides of the test specimens until a width of 1 inch of woven fabric remains.

Inspection and Rejection.—6. The inspector shall mark all accepted material close to the end of each bolt, with the official acceptance stamp. Rejected material shall be marked with the rejection stamp and shall not be resubmitted without the specific consent of the purchaser. The acceptance and rejection stamps shall be placed so that they do not injure the material, or, in the case of rejected fabric, so that the marking does not preclude the use of the material for other than air craft work.

Replacement.—7. All fabric that does not conform to this specification shall be rejected and shall be replaced by the manufacturer at his expense.

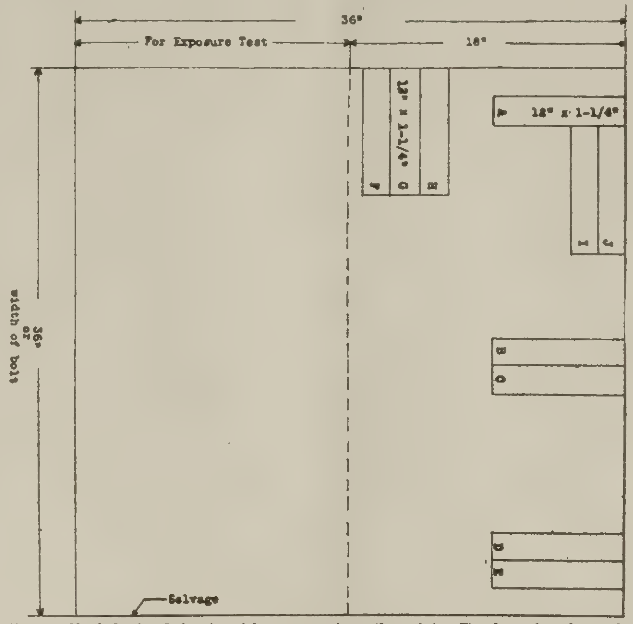


Fig. 1.—*Sketch showing the location of the 10 test specimens (lettered A to F) to be cut from the sample.*

Specifications for Unmercerized Cotton Aeroplane Fabric (Grade B)
(2F4 April, 1918)

General.—1. The general specification 1G1 shall form, according to their applicability, a part of these specfications.

Material.—2. (*a*) The warp and filling yarns used in the manufacture of this fabric must be size 3/80, according to the English cotton yarn numbers. A tolerance of plus or minus four (±4) will be allowed in the size of single yarns.

(*b*) The length of the staple of the fabric must not be less than 1½ inches.

Manufacture.—3. (*a*) The yarn shall be combed (single or double).

(*b*) It is recommended that the single yarn be given 36 to 40 turns per inch of twist and that 18 to 20 turns per inch be used for twisting these yarns together. This procedure may be altered provided that the fabric conforms to this specification in other respects.

(*c*) There must be at least 68 threads and not more than 72 threads per inch in both warp and filling.

(*d*) The weave shall be a plain weave.

(*e*) The fabric must be uniform in structure and free from manufacturing imperfections.

(*f*) The fabric, under normal moisture conditions, must not weigh more than 4.2 ounces per square yard.

(*g*) The width must be 36 inches.

Physical Properties and Tests.—4.—*Tensile Test.*—(*a*) The tensile test specimens, prepared in accordance with paragraphs 5 (*a*), 5 (*b*), and 5 (*c*), shall be exposed for at least two hours in an atmosphere of 65 per cent relative humidity at 70° F. (21° C.) and then tested in this atmosphere.

(*b*) The distance between the jaws or clamps of the testing machine, at the beginning of the test, shall be 8 inches (20 cm.). The pulling jaw shall move at the rate of 12 inches per minute during the test.

(*c*) The average breaking load of the five specimens, cut in the direction of the warp and the average breaking load of the five specimens cut in the direction of the filling, as shown in Fig. 1, must each be at least 70 pounds.

(*d*) The elongation shall be observed when the specimens are subjected to each of the loads given in Table 1.

(*e*) Whenever practicable an autographic record shall be taken.

(*f*) The elongation must not exceed the values given in Table 1 by more than 10 per cent.

(*g*) The average results for both warp and filling shall be reported separately.

Table 1.

Tension in pounds.	Elongation in inches, warp.	Elongation in inches, filling.
10	0.84	0.68
20	1.06	.84
65	1.53	1.24

Test for Sizing.—(*h*) Tests for sizing shall be conducted as follows:

(1) Dry samples weighing approximately 0.18 ounce (5 gm.) in tared weighing bottles at 221 to 230° F. (105 to 110° C.) to constant weight.

(2) Boil the samples in water for 10 minutes and rinse thoroughly.

(3) Digest each sample in a solution containing 15 cubic centimeters

(*Continued on page* 369)

NAVAL *and* MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1.—Report to points named for temporary duty in the order given.

Note 2.—Report to district manager of equipment, Detroit, Mich.

Note 3.—Report to district manager of equipment, 15 Park Row, New York City.

Note 4.—Report to Signal Corps Recruit Bureau, Fort Wayne, Mich.

Note 5.—Report to Production Engineering Division, Curtiss factory, Buffalo, N. Y.

Note 6.—Report to Ballon Detachment, Fort Monroe, Va.

Note 7.—Report to Captain Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 8.—Report to oil branch, fuel and forage division, Quartermaster's Corps, 51 Chambers Street, New York City.

Note 9.—Report to commanding general, Eastern Department, for duty with Departmental Aeronautic Officer, New York City.

Note 10.—Report to District Approvals Officers, Lindsey Building, Washington, D. C.

Note 11.—Report to San Antonio, Texas, at Aviation Construction Camp.

Note 12.—Report to Camp Alfred Vail, Little Silver, N. J.

Note 13.—Proceed to New York, N. Y., for permanent station.

Special Orders 80-84 inclusive

A

Aaron, Samuel A.	SLR; DIK
Andrew, Flynn L. A.	FLR; CGC
Austin, Charles Bernard	SLR; DIK
Arrington, Walton Mitchell	SLR; BST
Arnold, Leslie Philip	SLR; RWT
Allison, Stanton Willetts	SLR; RWT
Adriance, Guy W.	FLR
Albertson, Edward R.	SLR; DIK
Agar, William M.	FLR
Alexander, Stirling Campbell	FLR
Anable, Samuel	KST
Appleman, Earl	SLR; AAD
Appleton, James Lamar	SLR; PMT
Adams, Robert J	Note; 8
Asbury, Ernest C.	SLR; REL; WCS
Archer, Allen T.	EOT
Auchard, Oliver C.	EOT
Austin, Charles B.	EOT
Ackerman, Edgar M.	FLR
Adams, Chester A.	DIK

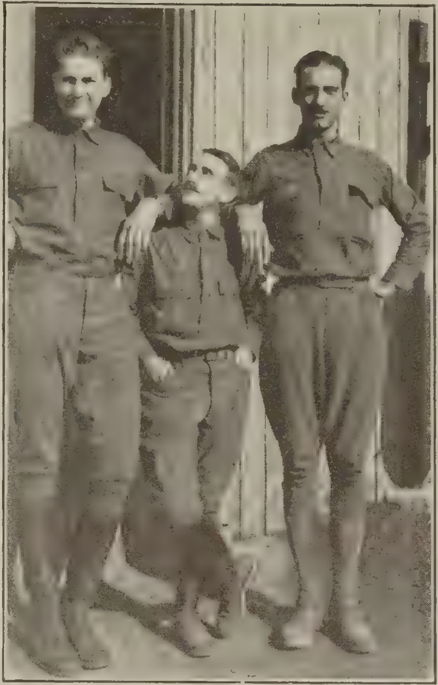
B

Bobbitt, Daniel Franklin	SLR; KST
Brush, Spencer	SLR; KST
Bufkin, Charles Cleonore	SLR; KST
Burtt, Howard Johnston	SLR; KST
Blackmer, Lawrence Morton	SLR; RWT
Barnes, James Gilman	SLR; SBI
Blanchard, Carleton Woodman	SLR; KST
Brewer, Kenneth Elting	SLR; KST
Boyle, John Patton	SLR; DIK
Blackburn, Lloyd Chartley	SLR; KST (2)
Burne, Joseph V.	DIS
Bailey, Henry Pinney	SLR; BST
Benson, Philip	SLR; LDT
Barnard, George A.	SLR; DIK
Bennett, Horace R.	SLR; DIK
Browning, Russell	SLR; DIK
Brown, Ray Baxter	SLR; PMT; FRF
Boothby, Wallace J.	DIK
Bingham, Halsey L.	FRF
Bibb, John T., Jr.	SLR; DIK
Batchelder, William Ward	SLR; KST
Burns, Ruel Fox	SLR; CWT
Becker, Joseph Francis	SLR; KST
Bowler, Harry Newman	SLR; KST
Barry, Rutledge B.	FLR
Bevin, Allen W.	FLR
Blanchard, Merrill	FLR
Bulkley, Harold K.	FLR
Byerly, Frederick M.	CRI
Beardman, Vinson R.	DIK
Barr, George B.	GLC
Beardsley, Charles B.	GLC
Boyd, John P.	GLC
Bandy, Russell M.	CRI
Blanchard, Carleton O.	DIK
Baskin, Thomas H.	SBI
Bonner, James L.	SLR; KST
Butterworth, Benjamin F., Jr.	DIK
Benham, Reed F.	SLR; DIK
Bonnevalle, Richard W.	SLR; DIK
Brewer, Kenneth E.	DIK
Begni, Tito	SLR; KST
Brown, Ray B.	DIK
Burr, Alexander T.	SLR
Berry, Norman K.	FLR
Butler, Edward E.	FLR
Bertaud, Lloyd W.	DIK
Balfour, Max	FLR
Bird, Allen T., Jr.	FLR
Burkholder, Albert N.	BST
Broderick, Joseph H.	DIK
Butterfields, Harold H.	SLR; DIK
Bergh, James R.	DIK
Beresford, Paul Converse	SLR; RWT
Barbee, Stanley Newbold	SLR; DIK
Barnitz, Richard B.	PFO
Baxter, Hubert E.	SAG
Biggs, Frederick Pearce	SLR; DIK
Black, Robert Overton	SLR; PMT
Brewer, Scott R.	FOB
Ballard, Aubrey Blaine	SLR; EOT
Beach, Merritt S.	EOT

Blanchard, Leslie David..............SLR; PMT
Bower, Raymond Gladestone........SLR; RWT
Benedict, Robert P..........................EOT
Birnbaum, Bert J.............................EOT
Blanchard, Leslie D..........................EOT
Bergh, James Richard................SLR; PMT
Burdick, Earl Kirkwood..............SLR; KST
Bliss, Carlton M..............................EOT
Braukman Clarence A........................EOT
Brady, William T..............................EOT
Brownlee, Fred P.............................EOT
Byrne, Granville W..........................EOT
Baker, John F...........................REL; OSU
Brown, William C. F..................REL; CDT
Brooks, Walter Ernest.......................CGC
Bentley, Madison ....OSU
Bellmont, Leo Theodore.....................CPR
Brew, Paul ....GLC
Begert, Howard Z.............................DIK
Burch, Mark H.................................EOT
Bruett, William F.............................FRF
Bryan, William D.............................GLC
Bolton, John H................................GLC
Blair, Samuel A...............................GLC
Banfill, Charles Y.............................GLC
Black, Avery J.................................GLC
Bryant, Marquis V............................CAF
Boothby, Wallace J............SLR; FRF; PMT
Boggs, Marshall S.............................DIK
Bondurant, David S...........................DIK
Buckner, Frank ....DIK
Bergen, Elston H., Jr.........................PUP
Brown, Edward ....FRF
Blankenship, Fred M.........................FLR
Berttrand, Lloyd Wilson.............SLR; LDT

C

Cahn, Henry Emanuel................SLR; KST
Carrithers, Henry Havens............SLR; KST
Carroll, J. Harold.....................SLR; KST
Chamberlin, Morgan Gould..........SLR; KST
Chapman, George Arthur............SLR; KST
Cousins, Wayne Kelly................SLR; KST
Cowan, John ....SLR; KST
Carroll, Lee Joseph..................SLR; RWT
Clark, William James.................SLR; DIK
Crouch, Norman Simmons....................SLR
Case, Ira Hamilton............................CPR
Clark, McKinley F.............................DIK
Chadbourne, Reuben J........................DIK
Collins, Kenneth G...........................FLR
Craig, Alexander M...........................FLR
Cameron, Burr Solomon..............SLR; DIK
Castle, Benjamin F...........................FRF
Chandler, Harry A...........................RWT
Chirieleison, Frank ....DIK
Clapperton, George Douglas..........SLR; LDT
Cleary, Leslie Alan...................SLR; CWT
Cunningham, Walter F........................KST
Campbell, Don M......................SLR; PMT
Conklin, Claude Reddy...............SLR; RSD
Chilton, Arch G..............................FRF
Cavagnario, James F..........................DIK
Capron, Louis B..............................SLR
Clark, John B..........................SLR; PMT
Carbeth, Walter W....................SLR; DIK
Cripe, Elmer Sylvester...............SLR; DIK
Carhart, Harold W...........................HHN
Christian, Clarence H.......................GLC
Clark, John B.................................GLC
Calver, Cecil Baltimore...............SLR; KST
Clarke, Alexander H.........................WAC
Crary, Roy Palmer.....................SLR; PMT
Campbell, Don M..............................FRF
Clapperton, George D.................SLR; DIK
Cadbury, Earl S...............................FLR
Chalaire, Walter ....FLR
Conover, Harvey ....FLR
Cooper, Walter W.............................DIK
Carter, Paul B.................................DIK
Clark, Eugene C...............................FRF
Chapin, Allison H.............................FLR
Cheston, Galloway C..........................FLR
Colleton, Thomas E...................SLR; DIK
Clarkson, Cyrus E............................FRF
Cline, Richard Earl....................SLR; KST
Campbell, Horace L...................SLR; DIK
Camaron, David ....SLR; DIK
Cole, Charles C.........................SLR; DIK
Carrol, Lee J...................................DIK
Campbell, Don M..............................DIK
Clark, Albert ....SLR; DIK
Curley, Martin L.............................WAC
Caldwell, Joe H...............................DIK
Calef, Robert C.........................SLR; DIK
Carroon, William E., Jr.....................EOT
Carveth, Walter W...........................EOT
Carvin, Charles W...........................EOT
Clark, Ralph I.................................EOT
Clark, William J..............................EOT
Coffing, Lawrence D.........................EOT
Comly, John ....EOT
Compere, Harold..............................EOT
Consolvoy, Leon L............................EOT
Cooper, Robert B.............................EOT
Colville, Clifford J...........................EOT
Capron, Louis Bishop.................SLR; KST
Craig, John W.................................FRF
Czarnieeki, Myron J.........................PWM
Clark, John Balfour...................SLR; PMT
Curran, George Aloysius.............SLR; KST
Carveth, Walter William.............SLR; DIK
Cashman, James A............................CSO
Chambers, Stewart M.................REL; CDT



"Big Bill" Taylor, "Shorty" Estey, and "Long George" Philipoteaux are all in the same class in the American Ecole d'Aviation in France

Cortright, Edgar M...................REL; CDT
Colby, Oliver Messer..................SLR; EOT
Colt, Russell G...............................AGC
Cady, Curtis L................................TFT
Cheak, Chester W.............................TFT
Churchill, Henry S............................TFT
Clark, Harold F...............................TFT
Coyle, Walter W..............................TFT
Cronan, Robert T.............................TFT
Crowell, Reginald B..........................TFT
Coyle, Frank.. J...............................GLC
Coulter, William A...........................GLC
Carlin, John F.................................GLC
Corkins, Vernon G............................MSC
Cantwell, James W............................DIK
Centner, William F...........................DIK
Chapman, William V..........................DIK
Conner, William B.....................REL; CDT
Cavanaugh, Stephen E.......................FRF
Craig, James O................................KST
Carlton, Henry F..............................FRF
Compton, Ralph O............................CUI
Cadman, Lester E.............................ADT
Carlton, Henry F..............................DIK
Cottrell, George W...........................SMM
Carlton, Henry F..............................DIK
Cluley, John B................................CAF
Cabell, Philip F...............................DIK
Clapp, Algernon R.............................DIK
Craigie, Karl H................................DIK

Cleveland, Lyman W., Jr.....................DIK
Chilton, Ralph H..............................DIK
Clark, Earl W.................................GLC
Carter, Charles F.............................GLC
Camp, Julian W.........................Note; 5
Cainon, Cutler J.......................SLR; SAG

D

Downing, Clyde Clayton.............SLR; CWT
Duncan, Floyd Reed..................SLR; KST
Daniels, Emery Clair.................SLR; PMT
DeHart, James.........................SLR; PMT
Desmond, James Philip..............SLR; RWT
Diggins, Ralph Clayton..............SLR; DIK
Drueding, Albert J...........................HHN
Disher, Harry P..............................WFO
Dodd, Spencer S..............................FRF
Doyle, John Cyril......................SLR; CWT
de Villeneuvre, Jules.................SLR; KST
Dugas, Graham Chesterfield.........SLR; PMT
Duffield, LeRoy Banks................SLR; PMT
DeCourcy, William E..................SLR; DIK
Donalds, John E........................SLR; DIK
Duffield, Leroy B.............................DIK
Duke, Leslie B................................DIK
Davies, William R............................DIK
Ditty, Cecil Amos......................SLR; HHN
Davenport, William Horace..........SLR; HHN
Dodge, Walter Eugene................SLR; DIK
Davis, Charles Thompson............SLR; DIK
Downs, Norton, Jr............................FLR
Dorrance, Georga W..........................DIK
D'Arcy, James, Jr.............................GLC
Dimming, Howard ....SLR; AAD
Dunn, Thomas F..............................DIK
Disque, Brice P...............................REL
Duncan, Malcolm W..........................DIS
DeShong, Lloyd M............................BST
Dean, John R..................................BST
Dodd, Spencer S..............................DIK
Denmark, Leonidas P..................REL; CDT
Dorland, Chester P..........................RWT
Davey, John A.................................FRF
Dennis, Eugene T.............................TMA
Drew, Lionel E................................WFO
Douglas, Walter C............................CPR
Davis, Donald D..............................MJR
Disque, Robert C.............................CPR

E

Evans, Edward Manfred...............SLR; CWT
Edwards, Claude Reynolds...........SLR; PMT
Easterling, Anthony Morgan..........SLR; LDT
Everest, George Folsom...............SLR; MDO
Emerson, Alfred Charles...............SLR; DIK
Estabrook, Benjamin W.......................CSO
Everson, Charles W................WCS; Note 10
Ellis, George W................................FRF
Ellis, Richard W........................REL; CDT
Ely, Alfred ....CPR
Espy, Bruce M..................................FRF
Eldred, Warren B..............................FRF
Ealand, Frederick T...........................CPR

F

Foster, Harold Gifford.................SLR; GLC
Fonseca, Francis M....................SLR; DIK
Foque, Edwin Narcisse................SLR; CWT
Falk, Frederick F..............................CGC
Flagg, William Junkin..................SLR; BST
Frazier, Frank D...............................TMA

A group at the 2nd Aviation Instruction Center in France. Left to right, top row, J. E. Bristol, A. B. Sherry, Pilot Courhan, Edward Hastings and William Hall. Bottom row, Harold Buckley and M. G. Lee

Fitch, James V	SLR; DIK
Few, Lindsey, Durham	SLR; KST (2)
Fox, George B	FRF
Frost, Horace W	OSU
Fairchild, Muir S	FLR
Fox, Raymond F	FLR
Funk, James B	FLR
Fenno, Jesse K	FRF
Forgie, William L	FRF
Furman, Earl F	DIK
Forbes, Howell	HHN
Foster, Arthur P	FLR
Furlow, Allen J	FLR
Fidler, Charles F	GLC
Frost, John W	GLC
Frankenberry, Thomas H	DIK
Fidler, Charles Franklin	SLR; PMT
Frandsen, Arthur Sievert	SLR; LDT
Friedman, Max Henry	SLR; PMT
Frissell, Patrick	ELA; WCS
Foster, Ralph F	SLR; DIK
Forseth, Albert John	SLR; RWT
Flickinger, Harrisson W	CPR
Fuss, Eli E	CRI
Frierson, Samuel G	PFO
Franklin, George T	DIK
Friesen, Ernest C	GLC
Foster, Carl, A. C	GLC
Forgie, William L	GLC
Farnsworth, Augustus P	GLC
Franklin, William E	FRF
Fries, Walderman H	DIK
Forseth, Albert J	DIK
Fowler, Gordon	TFT
Ford, Edward B	DIK
Freydig, Paul E	DIK
Foster, Harold G	DIK
Fagg, Fred D., Jr	EOT
Fillmore, William H	EOT
Fox, George B	EOT
Frazee, Harold D	EOT
Frankenberg, Thomas Howard	SLR; RWT
Frey, Newt	Note; 12
Flook, Harry Edgar	SLR; RWT
Furman, Earl Thomas	SLR; PMT

G

Goos, Carl Noward	SLR; PMT
George, Harold Lee	SLR; LDT
Gibson, Edward B	SLR; DIK
Grimm, Alfred	CSO
Gardner, John Henry	SLR; DIK
Gregory, Alexander Samuel	SLR; RWT
Gardner, Harold Adino	SLR; BST
Graham, Gregory N	FRF
Gardiner, Robert Rosborough	SLR; BST
Geisendorf, Louis C	SLR; DIK
Greenwood, Samuel A	SLR; DIK
Goad, John M	FLR
Graham, Charles, Jr	SLR; DIK
Golding, George Washington	SLR; KST
Gildersleeve, Samuel B	WAC
Green, Alfred M	HHN
Gale, Guy, H	FLR
Gardiner, Franc J	FLR
Gomes, Russell	DIK
Gregory, Alexander S	DIK
Ganey, Daniel F	DIK
George, Harrold L	DIK
Gould, Richard H	SLR; DIK
Goodier, Chester J	WAC
Gilbert, Howell	AGC
Graham, Andrew Joseph	SLR; PMT
Gibson, George W	CAP
Gaalaas, Rudolph L	REL; CDT
Graft, Louis E	DIK
Graham, Maurice F	DIK
Gaines, Edmund P	DIK
Godman, Louis K	DIK
Gardner, John H	TFT
Griffith, Clyde F	TFT
Greene, Carl F	BST
Gardner, Roy B	DIK
Gordon, John, Jr	CPR
Gates, Percival Taylor	SLR; PMT
Greenwood, Chester L	FRF
Gilmore, Donald H	EOT
Golonsbe, George J	EOT
Graham, Charles, Jr	EOT
George, Roland H	BST
Griffith, Fred Crum	SLR; PMT

H

Huking, Harry Walker	SLR; RWT
Harris, Allan Beck	SLR; DIK
Hadden, Frank Elliott	SLR; SBI
Hart, Floyd Henry	SLR; CAF
Huber, Howard Frederick	SLR; CWT
Harvey, David Charles Barrett	SLR; KST
Hodges, Clarendon K	SLR; KST
Holloway Phil R	SLR; KST
Hose, George Harrison	SLR; KST
Hoyt, Howard Cook	SLR; RWT
Huking, Harry W	DIK
Huntley, James W	MSC
Hall, William C	FLR
Hanley, James P., Jr	FLR
Hardin, Temple P	FLR
Hoggson, Wallace	FLR
Hill, Curtis L	FLR
Holtz, Harold F	FLR
Howarth, Everett F	FLR
Hubbell, Sherwood	FLR
Haddon, Julian B	FRF
Harter, Lester S	FLR
Holden, Lansing C., Jr	FLR
Harman, Harold George	WAC
Hammond, Reginald G	FRF
Humphreys, Frederic E	FRF
Hendricks, George F	DIK
Harney, Morris H	FLR
Harris, Anthony Byron	FLR
Heyworth, Otto Young	FLR
Holt, William Stull	FLR
Harrison, Dwight, Jr	SLR; KST
Hyland, George N	DIK
Harrison, William W	FRF
Harris, Roy D	WAC
Hall, John C	GLC
Hunn, William F	GLC
Hull, Kenneth D	CSO
Hart, Floyd H	DIK
Henderson, Albert H	RWT
Hoisington, E. M	FRF
Haller, Carl A	BST
Hurd, Leland C	BST
Hamilton, Arthur G	DIK
Heafer, Harold William	SLR; PMT
Harris, Joel Graves	SLR; PMT
Hendricks, George Fox	SLR; PMT
Hamilton, Arthur Girard	SLR; PMT
Hendee, Henry Dodge	SLR; KST
Hedlund, Theodore Erick	SLR; PMT
Hefferman, Lee G	TMA
Hicks, Harlie H	CSO
Higgins, Eugene C	DIS
Hicks, Charles C	FRF
Handy, John Custis	CPR
Haskins, Charles H	FRF
Hyland, George Norman	SLR; PMT
Hall, Howard Adgate	SLR; PMT
Hooks, Arthur Johnston	SLR; EOT
Horton, Charles M	CSO
Honhart, Harold E	FRF
Haney, Wayman	FRF
Harper, William J	SLR; CSO
Hofflund, John L	DIK
Hoisholt, Arne Knid Bours	DIK
Hughes, George P	GLC
Holladay, Daniel M	GLC
Halton, Travis L	GLC
Harris, David B	DIK
Henricks, Harold Hopkins	SLR; RWT
Haddon, Julian B	PFO
Harmon, Frank H	PFO
Hartshorne, Frank W. K	PFO
Hill, Edward A	PFO
Hughes, Francis F	PFO
Hughes, Earl C	ADT
Howard, Edward P	DIK
Hutchinson, James T	DIK
Hersey, George F	FLR
Hastings, Charles E., Jr	DIK
Healey, Claude S	DIK
Hughes, Joseph V	DIK
Hagman, Charles A	WAC
Henderson, Marshall	REL; VBW
Hughes, Harry F	CUI
Haller, Hubert G	Note 4
Hoyt, Ross G	Note 4
Hall, Howard A	EOT
Halloran, Earl J	EOT
Hedlund, Theodore E	EOT
Hoffman, Charles Riker	SLR; PMT
Haskins, Charles H	TFT
Homan, Charles H	CUI

I

Ignico, Robert V	Note 6
Irish, Harold E	EOT
Illich, Jerry T	DIK
Immig, August C	DIK
Ives, Joseph F	DIK

J

Johnston, Homer W	FLR
Junkin, James Willis	SLR; PMT
Jamison, Joy Gillian	SLR; RWT
Jordan, James Jeffries	SLR; PMT
Jaenke, William Daniel	SLR; PMT
Jones, Lloyd Theodore	CSO
Johnson, Clarence Herkel	SLR; LDT
Jones, Kirtley	SLR; PMT
James, Louis T	SLR; KST
Jack, Butler, Jr	SLR; DIK
Johnson, Costa N	FLR
Jewett, George D	SLR; DIK
Johnson, Clarence H	SLR; DIK
Jeffries, John M	GLC
Joseph, Paul H	DIK
Jenkins, Albert Edward	SLR; CSO
Jones, Brevard McRee	SLR; PMT
Jannus, Roger W	CPR
Jones, Paul J	TFT
James, Van Allen	DIK
Johnstone, Clifford	DIK
Jones, Daniel B	RII
Jewell, Sidney L	DIK
Johnson, Bruce	DIK
Jackson, Norris D	PFO
Jones, Brevard M	EOT
Junkin, James W	EOT

K

Kavanaugh, Claude	SLR; EOT
Kennedy, Ardis Morrison	SLR; PMT
Keys, Arthur Aloysius	SLR; CWT
Kirkpatrick, James D., Jr	SLR; PMT; FRF
Kanitz, Edward Clarence	SLR; PMT
Koster, Harold Beresford	SLR; EOT
Kirkendall, Freeman Burdette	SLR; KST
Kane, John Michael, Jr	SLR; KST
Kindig, Theodore Perrin	SLR; PMT
Koehler, Herbert O	REL; CDT
Kiel, Charles Emil	SLR; KST
Kales, William Robert	CPR; CSO
Kirby, Charles H	CSO
Kirk, John Barnes	SLR; DIK
Katzenberg, Herman Stanley	SLR; RWT
Knowles, William H	ADT
Kloo, Carl H., Jr	SLR
Keeffe, Louis R	GLC
Kennedy, Frank E	GLC
Kruss, Edmund A	FRF
Kubel, Herbert G	DIS
Kalkman, Eugene C	FRF
Kiley, Leroy D	FLR
Knight, Duerson	FLR
Keller, Frederick W	PFO
Kibbe, Gordon M	FRF
Keeley, James H., Jr	DIK
Kimball, Dan A	GLC
Kauffman, Stephen T	FRF; GLC
Kaplowitt, Mack B	GLC
Kittell, Mellon F	GLC
Kirkendall, Freeman B	DIK
Kepler, Frank Leslie	SLR; KST
Knowles, John A	DIK
Keiner, Carl W	DIK
Keenan, Walter M	ADT
Kennedy, Ardis M	EOT
Knapp, Robert D	EOT

A Spad being assembled at one of the French camps. (French Official Photo)

Lieut. David H. Backus, of St. Paul, Minn., is serving with the American Expeditionary Forces

Krohn, William	EOT
Kelley, Ralph L.	Note 11
Kalmbach, William	Note 4

L

Leslie, Freeland Huston	SLR; WFO
Lightfoot, William H.	FLR
Land, Harry L.	DIK
Livingston, Clarence A.	REL; CSO
Law, Hugh B.	SLR; DIK
Lenox, William J., Jr.	SLR; DIK
Lackland, Frank D.	SMM
Lesher, Lea R.	WFO
Lazar, Eugene	CSO
Lawrence, Herbert R.	CPR
Lindeburg, Alfred	SLR; PMT
Lindemann, Albion Blake	SLR; DIK
Leeds, Ralph Joseph	SLR; RWT
Leighninger, Robert Emmet H.,	SLR; PMT; FRF
Lokey, Walter R.	FRF
Livingston, John W.	FLR
Long, Hitlon W.	FLR
Lewis, Tracy Hammond	FOB
Lassiter, Robert E.	CPR
Lincoln, James Shoals	SLR; KST
Lindley, Stacey Bradford	SLR; KST
Lausier, Edwin B.	Note 13; WCS
Lockman, John Q.	Note 3
Lehmann, Henry P.	RRV
Lewis, Halstead H.	EOT
Lownsberry, Gay T.	EOT
Long, John Joseph	REV; Note 2; WCS

M

Meeker, Nathaniel Henry, Jr.	SLR; KST (2)
Manierre, James E.	CPR
Murphy, Edward Francis	SLR; PMT
Murphy, Cyrus W.	DIK
Morehead, John Lindsay	SLR; PMT
Miller, Wesley A.	DIK
Meraux, Jules Claude	SLR; EOT
Marshall, Charles R.	FLR
Metcalf, Manton Bradley, Jr.	SLR; PMT
Martin, Charles J.	TFT
Moore, Rush Ivy	SLR; PMT
McCrum, Richard D.	TFT
McCoy, John Findley	SLR; PMT
McWhorter, Ray S.	TFT
Marincik, Joseph Andrew, Jr.	SLR; KST (2)
Merritt, Harold D.	TFT
Martin, David Mathews, Jr.	SLR; PMT
Morrissey, Raymond A.	TFT
McGovern, John E.	SLR; DIK
Monroe, Charles H.	WAC
Morris, Edward S.	SLR; DIK
Moisant, Stanlie J.	FRF
McNulty, Dwight Leeds	SLR; PMT
Meacham, Jerome F. B.	DIK
Morehead, Joseph Hyde	SLR; RWT
Meeny, Philip J.	FRF
Mulvihill, Mead James	SLR; PMT
McRae, John	CPR
McKoy, Francis Kelton	SLR; PMT
McCullough, Charles Edmund	CPR
Murphy, Cyrus William, Jr.	SLR; LDT
McClellan, Albert L.	RII
MacGowan, Kenneth Arbuthnot	SLR; PMT
Maxim, George W.	FRF
Myers, William Blount	SLR; PMT
MacReady, John A.	BST
Martin, David James	SLR; KST (2)
Marshall, Craig W.	PWM
Miller, Wayne Leslie	SLR; KST
Morgan, Stuart A.	DIK
Moss, Royal Ross	SLR; KST
McMullen, Clements	FRF
Murray, H. Sinclair	SLR; RWT
Marshall, Oscar B.	SLR
May, Elmer Nicholson	SLR; DIK
Motley, Lanhorne W.	WAC
Mathews, John Joseph	SLR; DIK
Messenheimer, Floyd B.	SLR; KST
Miller, Bennie A.	SMM
MacMichael, John H., Jr.	SMM
Meldah, Carl John	SLR: EOT
McMurray, Ora D.	FLR
McMurty, Leslie B., Jr.	FLR
Malette, Frank Laverne	SLR; KST
Malcolm, Donald C.	FLR
Merz, Harold B.	FLR
Munson, Chester Neal	SLR; KST
Michener, John H.	FLR
Mitchell, Howard M.	FLR
Moore, Julian E.	REL; CDT
Mapes, S. Herbert	CPR
Murphy, William H.	CPR
Metcalf, Harry Hubbard	SLR; PMT
Maxim, George W.	DIK
Moran, George S.	DIK
MacDonald, Andrew Colin	SLR; KST
Murray, H. Sinclair	DIK
Mess, Robert W.	DIK
Morris, David R.	REL; CDT
McBride, James A.	FLR
MacDonald, Roy P.	FLR
McDougall, Kenneth	SLR; EOT
MacGowan, Kenneth A.	PFO
Mader, Luther P.	PFO
Moore, John M.	SLR; MSC
Maurer, William R.	PFO
McCulty, Dwight L.	PFO
MacDonald, James E.	SLR; GLC
McKenzie, Westley R.	DIK
McCoy, John F.	DIK
Morgan, William V.	SLR; GLC
Makielski, Stanley J.	SLR
Morehead, Joseph H.	DIK
Millard, Jesse C.	SLR; GLC
MacLeod, Everett H.	FLR

Lieut. Albert Hanford Coward, of Troy, Alabama, is with our boys "over there"

McFarland, Frank H.	FRF
Morris, William C.	SLR; GLC
Moran, George S.	FRF
Meadows, Ashbury W., Jr.	DIK
McLeod, Leland S.	SLR; FRF
Murphy William H.	CRI
Moon, Charles M.	SBI
Maxwell, Maurice Feger	SLR; RWT
Marsh, William Alexander	FLR
McLaughlin, John J.	DIK
Macdonald, Donald B.	SLR; SAG
Maloney, John P.	DIK
Means, James F.	DIK
McCarter, Erwin L.	SLR; PFO
Moore, William C.	CSO
Mills, Byron H.	CPR
Moon, Lawrence B.	DIK
Moye, James L.	DIK
Morrison, William R.	CSO
McBride, Walter J.	DIK
Meyer, Harvey Lee	DIS
Mason, Austin Blake	FLR
Metcalfe, Manton B., Jr.	DIK
McKimmon, William S.	DIK
Manier, Emmett M.	FLR
Moonan, James P.	FLR
McLafferty, Joel E. M.	RRV
McKimmon, William Simpson	SLR; PMT
Martin, Robert	EOT
McLean, Howard L.	VCB
Merritt, Harold Dutton	SLR; PMT
Murray Francis B.	Note 4
Meyer, Herbert A.	Note 4
Mason, Mayne S.	UIU
McEweh, Robert Russell	SLR; DIK
Miles, Paul K	GLC
Meyer, Walter William	SLR; RWT
McVetty, Percy G.	CUI
Murray, JamesO	PUP

N

Nimocks, Robert Gayle	SLR; PMT
Nourse, Roderick	SLR; DIK
Nelson, Paul Daniel	FLR
Nester, M.	FLR
Norris, Byron B.	FRF
Netcher, Fred	CPR
Nichols, Frank H.	UCB
Nahikian, Sarkis M.	SBI
Neeley, William H.	FLR
Nason, Arthur L.	GLC
Neuberger, Lawrence B.	GLC
Neville, Earl H.	FLR
Neidecken, Bertrand C.	FLR
Nagle, Walter G.	SBI
Niblack, Polk H.	DIK
Nelson, Guy Winfield	SLR; KST
Nelb, Alfred W.	EOT
Newman, Robert E.	EOT

O

Oliver, Ralph A.	FRF
Osbourne, David Munson	FLR
O'Brien, Martin J.	FRF
Orr, John C.	FRF
Ort, Karl Sanford	SLR; LDT
O'Brien, Maurice F.	SLR; DIK
O'Neil, James J.	SLR; DIK
Oatts, Vincent P.	FLR
Orr, Thomas L.	FLR
O'Neil, Charles	DIK
O'Connell, Robert E.	DIK
Owen, Morris C.	SLR; DIK
Orr, Tasso V.	WAC
Oberst, Clair R.	FLR
Orb, John A., Jr.	GLC
Olson, Charles W., Jr.	GLC

P

Post, Speed L.	FRF
Page, Frank Augustus	SLR; TFT
Payne, Charles	CPR
Plummer, Franklin Andrews	SLR; CSO
Patterson, Stuart Read	SLR; DIK
Prigmore, Raymond H.	REL; CDT
Plumer, William L.	DIK
Plummer, William L.	FRF
Padgett, Frank A.	DIS
Plumb, Marll J. L.	FRF
Paulson, Karl Frederick	SLR; DIK
Pillsbury, Edwin S.	FRF
Politoske, Edward J.	FRF
Peterson, Percy C.	DIK
Portner, Louis Jackson	SLR; KST
Potter, Norman W.	DIK
Peterson, Tenny C.	SLR; DIK

Charles Ward Hall, Jr., of Larchmont, N. Y., now in American service, formerly member of Second Platoon, Tours Aviation School

FOREIGN NEWS

CANADA

The Department of Indian Affairs of the Dominion Government has decided to allow the Indians to sell spruce timber for aeroplane purposes on the Tscheacton reserve. O. Bowman of Chilliwack has completed a shipment of two cars of spruce for this purpose.

FRANCE

The French official announcement of April 15th says:

"During April 13th and 14th four enemy aeroplanes were shot down. Our bombing machines dropped 3,000 kilograms of projectiles upon enemy establishments and convoys in the region of Montdidier."

The following aeronautical operations are reported on April 17th:

"On April 15th and 16th four German aeroplanes were brought down. It is confirmed that two additional enemy machines were destroyed April 12th."

Extensive aerial operations are summarized in the French official announcement of April 20th:

"On the night of April 18th-19th nearly four tons of projectiles were dropped by fifteen of our aeroplanes on the landing ground at Champion and bivouacs in the region of Ham, Guiscard, and Noyon.

"On April 19th thirteen of our aeroplanes, in two expeditions, dropped 1,860 kilograms of explosives on the enemy organization in the region of Roye and Moreuil.

"On the night of 19th-20th seventy aeroplanes very effectively bombed the railway station at St. Quentin and numerous railways in the region of Jussy, as well as aviation grounds. More than fifteen tons of explosives were dropped.

"Another group of seven machines bombed the railway stations at Mont Cornet, Asfeld, and Hirson, and the aviation ground at Clermont-les-Fermes. Air patrols, flying at a low altitude, machine-gunned resting troops.

"It is confirmed that three additional aeroplanes have been brought down."

An enemy aeroplane succeeded in passing observation posts without being reported and flew over the district, says an official note, issued at Havre.

Several bombs were dropped near one of the camps for German prisoners. The material damage was slight and there were no casualties.

GERMANY

Enormous loss was caused by the fire which destroyed the Zeppelin works at Manzel, near Friedrichshafen. The plant had been transformed for the manufacture of aeroplanes of the Gotha type, according to reliable reports from Rorschach, on Lake Constance. Vast quantities of raw materials were burned, and it is reported at Constance that two large Zeppelins and forty aeroplanes also were destroyed, comprising the whole fleet then at the plant.

Many warehouses were reduced to ashes, as also were the offices of the plant, situated close to the workshops.

The fire broke out between 10 and 11 o'clock on Saturday and burned all day Sunday, according to two Swiss travellers who were in Friedrichshafen Sunday. The fire began with an explosion, and there were frequent explosions throughout Saturday night and the following day, apparently due to the bursting of gasoline tanks and hydrogen cylinders.

There was something like a panic in the town, where several houses were set on fire and others damaged. Masses of debris were hurled into the air by the explosions.

The material losses in the fire which destroyed the aircraft factories near Friedrichshaften were enormous, including thirty squadrons of aeroplanes reserved for use against the American air fleet, it was announced.

One hundred and forty persons were killed and 200 injured.

British and French air raids on Bavarian cities are increasing steadily and the damage to property, especially in the Palatinate, is very extensive.

This fact was brought to the attention of the Bavarian Chamber of Deputies by a Socialist interpellation asking:

"Is the Government aware of the fact that the population of Bavaria, and especially of the Palatinate, is suffering great material losses as a result of the steadily increasing aerial attacks? What does the Government intend to do regarding the compensation of those affected?"

The Socialists stated that hostile aerial attacks on a number of cities recently had increased greatly. Minister of the Interior von Brettreich said that the Palatinate had suffered severely from the recent aerial attacks, but for obvious reasons he could not dwell on the extent and the character of the damage. The Bavarian Government, he said, was willing to grant compensations for damage to property caused by hostile fliers.

GREAT BRITAIN

British aeroplanes did much low flying on April 15th and 16th, according to a New York *Herald* dispatch, above La Bassée-Estaires road, demoralizing the enemy's transport and artillery coming up to stiffen the Merville front. There has been a steady movement forward of additional heavy batteries, but the British airmen have delayed them greatly with bombs and machine gun attacks.

An official report on aerial operations April 16th says:

"Bad weather prevailed Monday, and there was only low flying. Four tons of bombs were dropped on different targets. No German aircraft were encountered. One of our machines is missing."

The British official communication dealing with aviation, issued April 19th says:

"The weather made it impossible Thursday for our aeroplanes to carry out more than low reconnoissances and to drop a few bombs on the area. At night nine tons of bombs were dropped on Bapaume, Armentieres and Warneton, and the railway junction at Chaulnes.

"All of our machines returned."

The British official communication dealing with aviation on April 21st says:

"The weather improved Saturday, but thick clouds prevented flying at high altitudes. Twelve tons of bombs were dropped on various targets, including Armentieres and the Thourot railroad junction.

"During the last few days, owing to better weather, there has been more air fighting. Six hostile machines were downed and three others disabled. Three of our machines are missing.

"Our night flying squadrons bombed Bapaume and enemy billets and the roads leading to the front. Hostile railway junctions also were attacked at Chaulnes, where a large fire was caused; at Junivelle, twenty miles northeast of Rheims, and at Bethenville. All our machines returned."

Stories of the magnificent work done by the British airmen continue to be recorded. None is more striking than a battle in which a British machine with a pilot and observer was attacked by eight enemy aeroplanes, reported by the Associated Press.

Terrific fighting ensued. The British aeroplane engaged the enemy so fiercely that three hostile machines were driven down out of control in the first few minutes of the engagement. The Germans were pumping streams of bullets into the British machine, and the observer was carrying on the fight after having been wounded in six places.

The British machine finally was so badly damaged that it caught fire and dived steeply. The pilot and wounded observer continued to engage the remaining five German machines, while their own was descending in flames.

The British aeroplane eventually crashed in No Man's Land, over which the German infantry were firing steadily with machine guns. The British infantry, however, organized a rescue party and brought the airmen back safely.

It is officially announced that the Committee on Production has approved an arrangement under which plain time workers in federated establishments wholly engaged in the manufacture of aircraft or aircraft parts have received a bonus of 12½ per cent on earnings.

Rear-Admiral Mark Kerr, a member of the Air Council, said recently that one of the first air routes the French are going to establish after the war is to Timbuctoo, when the journey will then only take four days, whereas it used to occupy four months. As a commercial undertaking that will result in a great saving. Four months' food alone would be a considerable item.

During one of the recent air raids, the largest anti-aircraft gun in the London district was worked by a gunlayer armed cap-a-pie in medieval plate armor, a breech-worker clad in chain mail, and a sight-setter attired in silk tights and a velvet coat.

The reason for this motley attire was that the alarm came while the gun crew were taking part in some amateur theatricals in their barracks, and they rushed off the stage in their medieval attire straight to their duties on the gun platform.

Every honor for valor that a British officer can gain has been won by Capt. James Byford McCudden, the star British airman, who has just been awarded the Victoria Cross, according to Associated Press correspondence. His other distinctions in the order of their award include the Distinguished Service Order, a bar to the Distinguished Service Order, the Croix de Guerre, Military Cross, bar to the Military Cross, and the Military Medal.

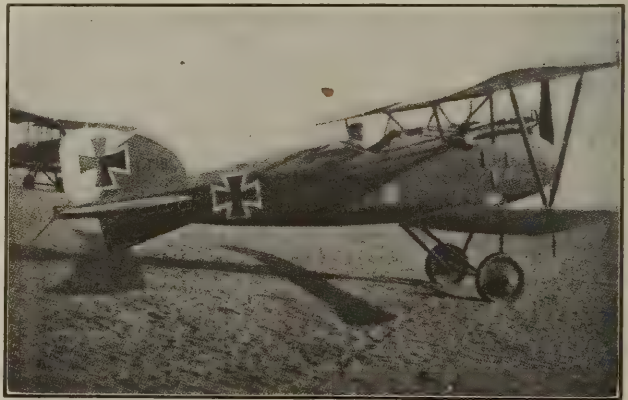
McCudden, who is now twenty-three years old, entered the British army as a bugler eight years ago. He went to France as a private in the original expeditionary force. Having had some experience in the air, he was pressed into service as an observer at Mons, and gave valuable information of enemy movements during the retreat. From a Sergeant he was promoted to a commissioned rank as an observer, and quickly won fame for his handling of a machine gun in aerial fighting. Since then he has had more than 100 fights without ever having sustained a wound.

Fifty-four German aeroplanes have been accounted for by Capt. McCudden. Of these, forty-two have been destroyed, nineteen of them on the British side of the lines.

"This officer is considered," says the official London *Gazzette*, "by the record which he has made, by his fearlessness, and by the great service he has rendered to his country, deserving of the very highest honor."

SWITZERLAND

The neutrality of Switzerland had been violated 586 times up to the end of January, according to an official announcement to-day. In 418 instances aviators were responsible. Switzerland has received little satisfaction for the protests made.



A German aeroplane captured by the British in Palestine. (British Official Phito)

MODEL NEWS

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Model Aerial Acrobatics

By Theodore Hodgdon

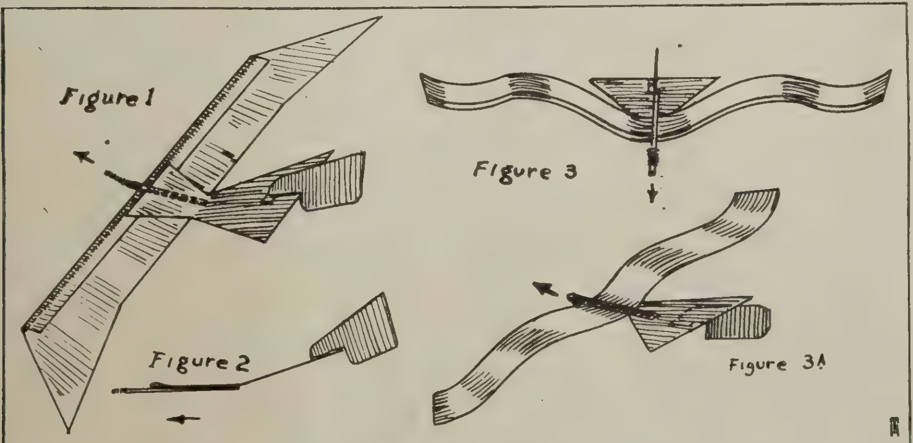
WIRELESS, clockwork, weights suspended so as to act as pendulums, and numerous other devices, have been used to compel models to do the various aerial "stunts," such as purposely side-slipping, looping-the-loop, tail-spinning and tail-sliding.

In the diagram below, Figure 1 shows a small paper glider which will prove a most interesting little exhibition model if made and thrown properly.

It is simply made of fairly stiff writing paper braced with wire, as indicated on the drawing with dotted lines. Wire wound around the longitudal brace serves to balance the model at a distance of one-half the chord. A wing spread of about seven inches and a length of 4½ inches (or less) will give good results. The tail, being set at a negative angle of about thirty degrees from the line of flight (as Fig. 2 shows) causes a suction or drag. Thus, when the model is held between the thumb and forefinger by the coiled weight, and thrown forward, it will loop-the-loop and glide gracefully to the ground.

Another stunt that this model performs successfully is the tail-spin, *i.e.,* it revolves about its tail, at the same time gliding toward the earth. To cause a tail-spin, warp the wings and throw the model in a bank. Invariably it will describe a wide curve and start downward, turning into a tail-spin. The reason of this, as near as can be determined, is that the wing warp starts the spin, but instead of revolving about the normal axis, as it should, the drag under the tail causes it to revolve about the tail.

Figures 3 and 3A show a model which possess remarkable stability in all directions. This model will perform the tail-slide successfully if dropped backwards (after making it slightly nose-heavy). After sliding backwards a few feet (it should be dropped from a roof or window-ledge) it will "nose down" and take a nose dive to earth. When dropped sideways it will right itself immediately, and if the nose is heavy will glide to earth. The elevator should be up in both cases.



Two of Theodore Hodgdon's paper gliders for performing "Aerial Acrobatics"

Tuning and General Adjustment of Models

TUNING up and adjusting models before flight forms, perhaps, the most interesting section of model aeroplaning since it is by overcoming the faults and endeavoring to elucidate the problems (exceedingly enigmatical at times), sometimes presented by a model's flight, that knowledge of the underlying principles of flight is attained. Mr. F. J. Camm, in *"Aeronautics"* gives some notes on the subject which should be of assistance to beginners particularly.

Firstly, then, as to launching. The tractor type requires to be launched slightly nose downwards, grasping the tractor in the left hand, with the right supporting the fuselage behind the center of gravity. The model is thrust forward at slightly *under* its flying speed, both hands being released simultaneously. It is good practice when testing a new model of this type to launch it down wind until the correct adjustment has been found, and, although it must be born in mind that this adjustment will not hold good for flying both with and up wind, a smaller negative angle being required on the tail for up-wind flying, it is much easier to tune a machine in this direction.

A twin screw pusher should be launched at a slight angle of elevation, holding the twin screws in the right hand, the left supporting the machine at an angel of four or five degrees, the model being thrust forward and released, as before. Here it may be remarked that it is far easier to launch a twin screw pusher when the propellers are revolving outwards.

Launching a model, however, after a time becomes purely a matter of knack—one unconsciously grasps the machine at the correct point and launches at the correct speed, so that we need not dwell upon this point further than to impress the importance of launching at the correct angle and speed.

We will assume that after launching a model of the tractor class it shows a strong tendency to fly in circles either to the right or left. This may be due (1) to torque, or the tendency of the screw to capsize the model in the oposite direction to which it is revolving, (2) to lack of alignment of the surfaces, (3) wrong adjustment of the rudder, (4) a warp in either the tail or mainplanes, (5) the propellers being out of pitch, and (6) (this cause of trouble is too often overlooked) the chassis heeling over in either direction and so causing the lateral centre of gravity to be out of line with the centre of the fuselage. If three or four degrees of ruddering fails to eliminate the first trouble, and provided that the model is correct with regard to the other possible causes, it may be concluded that the propeller is either of too large a diameter or too long in pitch, and a new propeller should be tried; but it can be taken as a general rule that the pitch should be made one and a half times the diameter, and this latter one-third the span, this rule referring to single screw models only.

(*To be continued*)

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Answers to Correspondents

R. F. C. (India).

There are several methods of exterminating mosquitoes. Perhaps the most effective and simple procedure is to obtain two blocks of wood (ash or spruce), each about 2 ins. square. Place the mosquito in the centre of one block, lay the other carefully on top, and place the whole in a press for about 7½ mins.

Designer (Farnborough).

No, it does not matter having the c.g. in the petrol tank, so long as a reliable filter is fitted.

Non-Stop (Claybury).

Yes, the war is still going on, and you are the 9849th correspondent who has solved the problem of perpetual motion.

Drachenflieger (Roehampton).

Rupert got his name for the same reason as the Blimp—because he looked it.

Fifty under (Bushmills).

To convert monoplane figures to biplane figures, use the following formula: $C_2H_5OH + H_2O$.

If the stagger is too pronounced, try more water with it.

Gordon (Kingussie).

Don't let that deter you. They are not worn in the R. F. C.

Pup.

All pupils are called "pups." We see nothing degrading in it. Don't worry, you'll grow up some day.

P. M. C. (Green Wood).

We suggest that you be governed by the two following "Air Laws":

Law I.—Taking the camber as being inversely proportional to the square of the slip-stream per foot-run, the formula

$$\text{Sin}^2\,\delta \int_0 \frac{\pi\, d\,\Theta \times 0.5\,\pi\,\xi\,C_{90}}{\triangle\,(\phi\,K)} + {}^3\sqrt{\psi} - \frac{P}{v} = A\left(\frac{l^e.m.O^n}{I}\right)$$

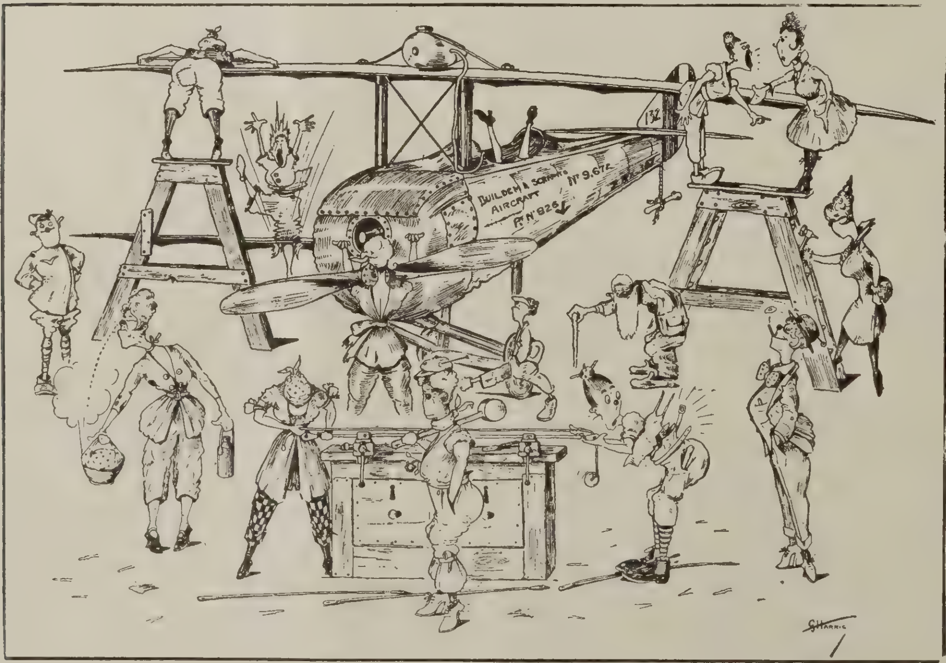
remains constant in perpetuity, always assuming that the conditions do not vary.

Law II.—Assuming staggered monoplane values for a given maximum range of uniform acceleration, the gyration of bifocal vortices approximate the empirical basis of the conjugate functions influencing the velocity potential of the modulus of elasticity resulting in the diminution of sustentation of all evanescent cyclic components of phugoids of negligible amplitude.

A Communication

Gentlemen:—We take great pleasure in informing you that the aeroplane mentioned in your last letter, which (by the way, is one of our most recent models) has shown most astonishing performances. It having attained an altitude of 18,000 in eight minutes, in the high speed test it surpassed our most sanguine expectation, easily drifting along at 308¼ miles per hour the low speed test was almost as remarkable, it seemed to stand perfectly still for several minutes than gradually rose, tail up, seemingly defying all the well known laws of gravitation, then without any apparent effort it performed a number of double loops, flip-flaps, cart-wheels??? Now, John, gratifying as the above appears it is not a circumstance compared to what we have under way, our new hover-clopter model 9 is a bird it will go so fast, that it will take two men to talk about it one to say HERE SHE COMES, the other, THERE SHE GOES, and as for speed, why I hate to talk about it as it sounds almost unbelieveable confidentially, we expect it to do in the neighborhood of 704 miles easy with the anti-gravitator attachment installed it should rise right smart, say 0¼ miles a minute.

G. J. C.



SCENES IN AN AIRCRAFT FACTORY

The Women's Assembling Shop

In the foreground, an unskilled laboress goes to work, skilfully combining the typical laborer's rig with the feminine allurement of a rose in her blouse and a projecting hat-pin. Behind her, a nattily attired worker, and one more carelessly clothed, prepares stays (or bracing wires) for the aeroplane, watched by a feminine equivalent of the juvenile—and exempted—shop steward. On the left, a hungry worker senses the odor of a full dinner-pail, to the amusement of an R. F. C. superintendent, who, doubtless out of regard for his charges, has fastened his tunic, womanlike, to the left.

—Courtesy The Aeroplane.

SAFE behind RESISTAL

"PROTECTEYES"

The Non-Shatterable Perfectly Transparent Glass in the best Aviator Goggles

The U. S. Bureau of Standards Report on Non-Shatterable Glass, says:—

"A 30 caliber bullet with a muzzle velocity of 2,700 ft./sec. was fired from a distance of 25 yards at a target supporting the glass. A bullet passing through type B glasses (this was RESISTAL) made a clean cut hole and produced numerous irregular cracks in each of the sheets of glass separated by the celluloid. These cracks were confined to a circular area of about 2 inches radius and the remainder of the plate remained practically uninjured. The cracks in the two plates of glass separated by celluloid in general, followed different directions, and did not register. This fact allowed the laminated plate to retain considerable rigidity even after it had been punctured. All the glass except a small area immediately around the bullet hole was firmly held by the celluloid."

"Ordinary plate glass, without celluloid covering, when struck by the bullet, flew into innumerable pieces and became a complete wreck.

"The relatively increased non-shatterability of laminated glass (this was RESISTAL) and its comparatively good transparency and rigidity even after puncture, give it great importance in devices for protecting the eyes and face."

(Signed by S. W. Stratton) Director.

B. S. Test No. 23004. Washington, D. C., March 25, 1918.

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If you cannot get RESISTAL PROTECTEYES at your Dealer, write to Sole Manufacturers

STRAUSS & BUEGELEISEN, 438 BROADWAY
NEW YORK CITY

(*Continued from page* 357)

commercial diastofor in 500 cubic centimeters water at 140° F. (60° C.) for two hours.

(4) Wash thoroughly in hot water and then boil for one hour in 500 cubic centimeters distilled water and wash again.

(5) Dry in tared weighing bottles to constant weight.

(6) $$\text{Percentage sizing} = \frac{\text{loss in weight}}{\text{original weight}} \times 100.$$

(*i*) The fabric must not contain more than 3.5 per cent of sizing, as determined by the above method.

SELECTION OF TEST SPECIMENS.—5. (*a*) Samples for tests shall be taken from at least five bolts in each warp woven.

(*b*) The sample taken from a bolt shall be 1 yard long and the full width of the bolt; it shall be cut from the fabric at a point 10 yards from the end of the bolt.

(*c*) Test specimens for tensile tests, 12 inches long and 1¼ inches wide, shall be cut from each sample taken as shown in Fig. 1. Threads shall be pulled out from the sides of the test specimens until a width of 1 inch of woven fabric remains.

INSPECTION AND REJECTION.—6. The inspector shall mark all accepted material close to the end of each bolt with the official acceptance stamp. Rejected material shall be marked with the rejection stamp and shall not be resubmitted without the specific consent of the purchaser. The acceptance and rejection stamps shall be placed so that they do not injure the material, or, in the case of rejected fabric, so that the marking does not preclude the use of the material for other than aircraft work.

REPLACEMENTS.—7. All fabric that does not conform to this specification shall be rejected and shall be replaced by the manufacturer at his expense.

Specifications for Aeroplane Spar Varnish. (2V1 March, 1918)

GENERAL.—1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

COMPOSITION AND GENERAL PROPERTIES.—2. The material shall be the best long oil varnish, suitable for application on wood, "doped" linen or cotton, and metal, and must be resistant to air, light, water, and to washing with warm soap water. The manufacturer is given the greatest latitude in the selection of raw materials and in the process of manufacture in order to produce a product of the highest quality.

PHYSICAL PROPERTIES AND TESTS.—3. The material shall comply with the following requirements:

(*a*) It shall be clear and transparent.

(*b*) Its color shall not be darker than a standard color solution, made by dissolving 6 grams of pure powdered potassium bichromate in 100 cubic centimeters of pure concentrated sulphuric acid (specific gravity 1.84). Gentle heat may be used, if necessary, to secure a perfect solution of the bichromate. The color comparison will be made by placing the varnish and the standard color solution in clear, thin-walled glass tubes of the same diameter, 1.5 to 2 centimeters (⅝ to $\frac{13}{16}$ inch), to a depth of at least 2.5 centimeters (1 inch), and comparing the colors by looking through the tubes across the column of the liquid by transmitted light.

(*c*) It shall not flash below 35° C. (95° F.) in an open tester.

(*d*) The varnish shall be flowed on one side of a 10 by 15 centimeter (approximately 4 by 6 inches) panel of bright tin. The panels shall be approximately 0.3 to 0.4 millimeters (0.0125 to 0.0158 inch) thick (90 to 100 pounds weight of base metal per standard box of 112 sheets, 14 by 20 inches, No. 30 to No. 28 U. S. standard plate gauge), and shall be cleaned thoroughly with benzol. When the panel is held in a vertical position and maintained at a temperature of 21 to 32° C. 70 to 90° F.), the varnish shall set to touch at a point not less than 2.5 centimeters (1 inch) from the side or top edges of the film, in not more than 5 hours; and shall dry hard in not more than 24 hours to a clear, hard, glossy film. The panel shall then be allowed to dry for a further period of not less than 5 days and then be brought to a temperature of not less than 21° C. (70° F.) nor more than 24° C. (75° F.), and maintained at this temperature for not less than 15 minutes. The panel, with the varnished side on the outside, shall then rapidly be bent double over a rod 3 millimeters (⅛ inch) in diameter. The varnish film shall show no cracking or flaking at the point of bending.

(*e*) The varnish shall be applied to a basswood panel which has been filled with one coat of drop black in oil thinned with turpentine and drier, and allowed to dry for not less than 10 days before applying the varnish. It shall have suitable body to give proper brushing, flowing, and covering properties. The first coat of varnish shall be allowed to dry 48 hours, then lightly sandpapered, a second coat applied and allowed to dry 72 hours. The panel shall then be inclined at an angle of about 45°, and a gentle stream of cold tap water allowed to flow down the middle of the panel for 18 hours. After wiping off any deposits due to the tap water with a chamois skin, the varnish shall show no whitening, dulling, or other defects. A small stream of boiling distilled water shall then be allowed to flow down another portion of the panel for 20 minutes. The water shall be siphoned through a small glass tube, directly from a container in which it is boiling, onto the surface of the panel, in such a manner that there will be no appreciable lowering of the temperature of the water before it touches the varnish film. The siphon delivery tube shall be in a plane nearly parallel to the plane of the panel, so that the impact of the water will not tend to break the film. The varnish shall show no appreciable whitening and no more than a very slight dulling or other indications of marked deterioration, either when observed immediately after removing from the water or after drying for 2 hours.

[NOTE.—In general, results comparable to those given by the above method may be obtained by flowing one coat of varnish on duplicate panels of bright tin, thoroughly cleaned with benzol, allowing to dry 48 hours, and then immersing one of the panels in distilled water at room temperature for 18 hours and the other panel in boiling distilled water for 15 minutes. But the test on wood should be made in all cases where there is any doubt regarding the resistance of the varnish to water.]

(*f*) The varnish shall be applied in three coats to two unfilled panels of maple wood not less than 14 by 45 by 2 centimeters (5½ by 18 by ¾ inch), allowing 3 days for the drying of each coat. The first coat, after drying indoors for 3 days, shall be sandpapered lightly with No. 00 sandpaper before the application of the next coat. The second and third coats shall not be sandpapered or rubbed, and the duplicate panels shall be exposed outdoors, 45° to the vertical, facing south, 3 days after the application of the finishing coat. The backs and edges of the panels shall also be varnished with three coats of the same sample, but for these surfaces the details of the method of application as given need not be adhered to, and the effects of exposure on these surfaces will not be considered. In the test, the varnish shall show satisfactory durability and weather-resisting properties. In cases when the award of a contract can not be delayed for the results of the exposure test, award may be made on the basis of the other requirements, but a varnish of any specific brand which does not prove satisfactory in the exposure test may be omitted from consideration in future awards, and a preliminary submission of samples for making exposure tests may be called for.

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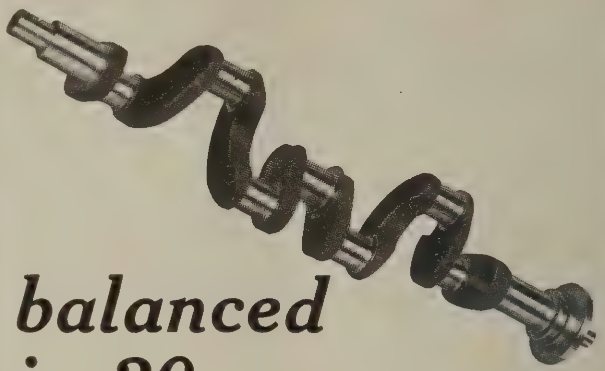

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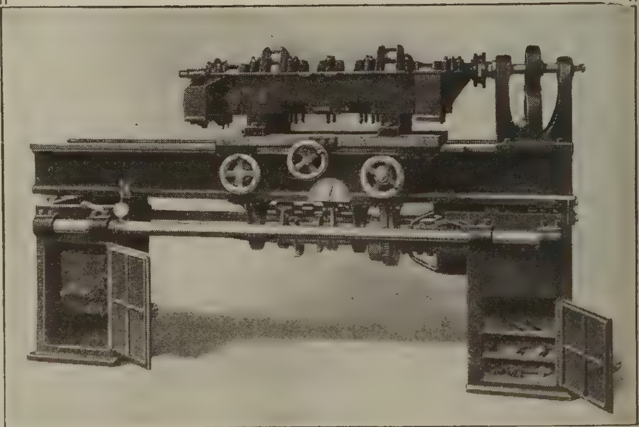

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WEEKLY

Vol. 7, No. 8 MAY 6, 1918 10 CENTS A COPY

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NO WRAPPING—NO ADDRESS
A. S. Burleson, Postmaster-General

Need of Aerial Supremacy Pointed Out by General Verraux

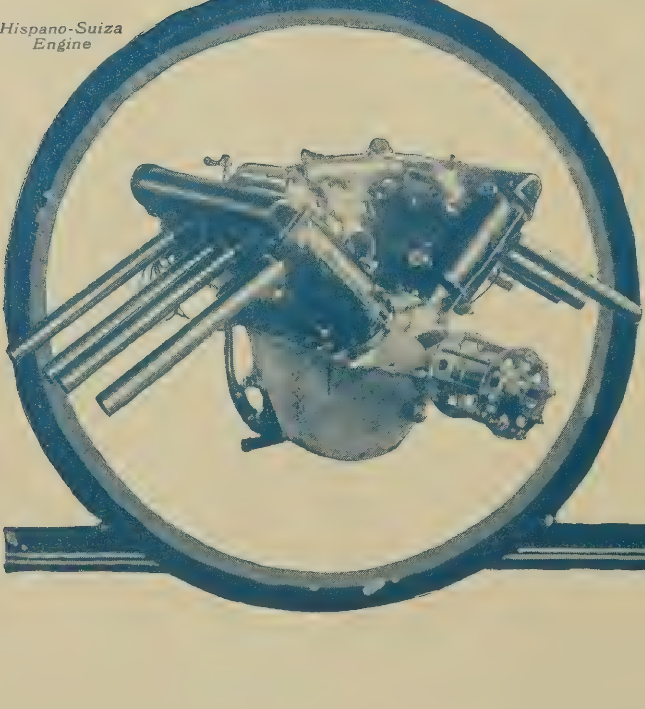
GROWTH

THE future mammoth growth of the airplane industry is indicated by such an organization as the Wright-Martin Aircraft Corporation now expanding rapidly under the leadership of men of known ability.

This company, originators of the basic aviation patents, has kept abreast of progress not only in the manufacture of airplanes, but also in the production of the famous Hispano-Suiza engine.

It is essential that executive ability of the highest order, as well as highest specialized manufacturing ability be combined in an industry whose future stands upon no precedent of the past.

Hispano-Suiza Engine



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VOL. VII NEW YORK, MAY 6, 1918 No. 8

NEED OF AERIAL SUPREMACY POINTED OUT

By A FRENCH GENERAL

IF the Allies cannot break the German lines they can leap them, and victory will come to the Entente through the air, General Verraux has declared.

In reviewing the possibility of two practically evenly balanced armies being able to break the other's line by force of arms, General Verraux declared that supremacy must come through the air.

"Modern armies must place their hopes in their airmen," he stated. "The victory which Germany believed always just within her grasp has been snatched away by the French, British, Italian and American airmen.

"With our air squadrons we have shattered traditions of former wars—we have broken the military formulas of yesteryear—when strategy won battles.

"If we cannot break through the enemy lines we can leap them, as proved in recent battles."

DIRECTOR OF AIRCRAFT PRODUCTION APPOINTED

ON April 24th Secretary of War Baker announced the appointment of Mr. John D. Ryan as Director of Aircraft Production for the Army, Brigadier-General William S. Kenly as chief of the newly created Division of Military Aeronautics, and Mr. W. C. Potter as chief of the Equipment Division.

The official announcement reads as follows:

"Mr. John D. Ryan has accepted the directorship of aircraft production for the army.

"A reorganization of the Aviation Section of the Signal Corps has been also effected, of which the principal elements are as follows:

"General Squier, as Chief Signal Officer, will devote his attention to the administration of signals; a division of Military Aeronautics is created, under the direction of Brigadier-General William L. Kenly. The Aircraft Board, created by Act of Congress, remains an advisory body as it has been in the past, with Mr. Ryan as its chairman. This arrangement is made with the entire concurrence of Mr. Howard Coffin, who remains a member of the Advisory Commission of the Council of National Defense, and will render assistance and counsel to the Aircraft Board and Mr. Ryan.

"The Division of Military Aeronautics will have control of the training of aviators and the military use of aircraft. The exact division of function in the matter of designing and engineering will be worked out as experience determines between the Division of Military Aeronautics and the Division of Production.

"This announcement involves no change of personnel in the present Equipment Division of the Signal Corps, of which W. C. Potter is chief, and will continue under his direction."

Mr. John D. Ryan, one of the country's foremost business organizers and industrial mobilizers, is best known for his work in connection with the world's greatest copper corporation, the Anaconda Copper Company, of which he is president. In the last year, however, Mr. Ryan has been continuously in the Government service, first as Director-General of Military Relief of the Red Cross and later as an advisor of the War Industries Board.

Brigadier-General Kenly, it will be remembered, was the first officer of the line to volunteer to take the course in aeronautics in the summer of 1916. He was also one of the first officers sent to France when the United States entered in the war and while in charge of the Air Service there did a great deal of flying and gained practical knowledge about aeronautics which the former heads of the Air Service home never gained. For this reason it is believed that there will be no further delay on deciding on types of aeroplanes to be manufactured after the General assumes his new duties.

Mr. William C. Potter entered the service of the Government on January 2d, in the equipment division of the Signal Corps, and is thoroughly familiar with the present perplexing aircraft situation.

Men Selected Generally Approved—New Legislation Required to Give Them Power

The selection of Mr. Ryan, General Kenly and Mr. Potter to manage the new program is generally approved, but it is being realized that their effectiveness depends on the organization and funds placed at their disposal. At present the new appointees have neither the organization nor the funds which are absolutely necessary to make and carry out a program necessary to build our aerial forces to the size required to beat Germany.

In making these appointments President Wilson went as far as he could under the existing legislation.

To provide the necessary organization and to make the change effective, Senator Wadsworth, on April 25th, introduced the following amendment to the Overman Bill, which was adopted by the Senate:

Sec. 3. That the President is further authorized to establish an executive agency which may exercise such jurisdiction and control over the production of aeroplanes, aeroplane engines, and aircraft equipment as in his judgment may be advantageous, and further, to transfer to such agency, for its use, all or any moneys heretofore appropriated for the production of aeroplanes, aeroplane engines, and aircraft equipment.

Senate Report of Delay in Aircraft Program Brings Severe Condemnations

The publication of the Senate report, published in AERIAL

Age for April 22d, showing the great delay in the aircraft program, and the reports of the apparent deplorable conditions were made in public charges by the investigators appointed by the President, caused consternation throughout the country and brought severe condemnations of Major-General Squier's administration of the air services.

On April 26th the New York *Times* said editorially:

AT LAST!

A long-suffering people will applaud the War Department's detail of General George O. Squier to "devote his attention to the administration of signals." As the genius of army aviation he has been a lamentable and exasperating failure. He was to produce great numbers of aeroplanes and train a host of aviators, thus insuring supremacy in the air for the Allies in France and putting out the eyes of the enemy. The opportunity to organize victory knocked at the door of the wrong man. It may always remain a mystery why George Owen Squier was selected to do one of the biggest things of the war. It is true that he became the head of the Signal Corps two months before the United States entered the conflict. If there was any other reason for giving him the authority to create an air fleet for an army greater than Wellington commanded at Waterloo it has not been divulged.

General Squier had no recognizable fitness for a task that called for executive ability, intimate knowledge of industrial conditions, and facility for dispatching business quickly. He knew nothing about spending vast sums of money. He did not know men. He did not have the vision of a pioneer or a promoter. He was simply a Signal Service officer interested in electro-chemical effects due to magnetization, the polarizing photo-chronograph, ocean cabling and multiplex telephony, and it is not of record that he was in any degree an authority on practical aeronautics. He had been Military Attaché at London before the war and danced well. No mystery is more inpenetrable than that surrounding the designation of General Squier to build myriads of aeroplanes and train legions of flying men in record time at an expense of billions of dollars. His failure to make even a good beginning of the job was tragical for the country, and it was cause for jubilation in Germany.

The enterprise had creeping paralysis from the first. It never straightened up and got to its feet. Hailed as a precocious and lusty child, it did not leave the cradle. Credulous and misguided officials passed the word that America was to have so many thousand aeroplanes by such a date, and those of any use to a field army could be counted on the fingers and thumbs when the time of performance came round. And then it was thought necessary to cover up the scandal, for the collapse of efficiency was nothing else, by solemn reviews of incalculable difficulties and unexpected obstructions that the War Department had had to contend with, ending with the assurance that the "peak of production" was now in sight and all would soon be well. But the performance could not have been more disappointing if the Germans had had a hand in it. In the history of American preparations for war there has been no worse exhibition of inefficiency, cross-purposes, and impotence than that made by the Signal Corps in aeroplane construction.

But the nightmare is over at last. General Squier returns to his signals and Mr. Howard E. Coffin ceases to be Chairman of the Aircraft Board with his "entire concurrence," to quote from Secretary Baker's reorganizing order inspired by the President. In place of General Squier as builder of the air fleet the country will have a representative of big-brained business, Mr. John D. Ryan of Montana, who is appointed Director of Aircraft Production for the Army, and Brig. Gen. William L. Kenly, U. S. A., as Chief of Military Aeronautics, succeeding Mr. Coffin, who has not been a satisfactory prophet. The country will now have well-directed hard work and very little talk from those responsible for army aviation. The "peak of production" may not be in sight, but it will soon loom up.

Thus is the berated investigating activity of Senator Chamberlain and his courageous associates vindicated. The American people owe them a debt of gratitude beyond words. We should think that those who have aspersed their patriotism would ask that their words be forgotten. As the result of hearings before Congress committees, the Ordnance Bureau, the Quartermaster's Department, and the Shipping Board have been reorganized, and to bring order out of conditions approaching chaos and to do big things in a big way Stettinius, Schwab, and Ryan have been called in. It recalls Opie's reply to the question how he mixed his colors: "With brains, Sir!"

The following are excerpts from the scores of editorials which have appeared in the newspapers throughout the country:

THE AIRCRAFT FAILURE

(*The Oklahomian*)

The senate military committee declares our aircraft program to be "gravely disappointing," and recommends "drastic reorganization of the production machinery." If the committee's statements of what has not been accomplished are statements of fact, the expression "gravely disappointing," is weakly inadequate, and the recommendation of "drastic reorganization" will be demanded by public opinion.

The production program of aeroplanes, which through fraudulent publicity the public had been misled to believe was going forward splendidly, is a myth, the committee says. It is alleged that 12,200 cadets, sent to France, England and Italy last year, have not been able to complete their training because we have not furnished them with planes. It is said that but 450 of those cadets have been graduated as fliers. The question of bringing those boys back to the United States, the committee avers, is now under advisement by the signal corps. There are twenty aviation schools in the country now, with a capacity of 3,000 cadets. Of those, 1,926 have been commissioned as reserve military aviators, but very few have received advanced training.

In the production of Liberty motors the same languor, not to say inertia, is charged. Of the 22,500 ordered "only twenty-two have been completed for the army, 142 for the navy, and four have been shipped overseas." Moreover, the glowing press notices of this motor are sadly discounted. The senate military committee declares that the "Liberty motor is not designed for and cannot be used in the swift, single-seated fighting machines." Its utility is restricted to the bombing machine.

The failure in aircraft production and management as portrayed by the senate military committee seems too complete to be credible. But if this assessment is correct or if it even approximates the truth, the official heads responsible for it should be cut off instantly—as instantly, for example, as England has just recalled General Gough for his failure at the front—and new methods should be instituted and new men chosen for this work. The tradition that the accused is entitled to his day in court, may be dismissed in this instance. The nation, in this crisis, is concerned only with the facts. Let the facts be determined and let action follow forthwith.

IT IS ABOUT TIME!

(*Cincinnati Times Star*)

On Tuesday the New York *World* printed an interview with W. A. Morgan, recently Vice-President and Production Expert of the Curtiss Aeroplane Company. His remarks constitute a vivid indictment of the lack of settled purpose which has so outrageously delayed work on our aeroplane programme.

Mr. Morgan tells how his concern was blocked in its effort to build battle planes by the inability of the Aircraft Production Board to settle upon a fixed type of machine.

"The changes ordered in the Bristol Fighter," says Mr. Morgan, "were literally hundreds. The first great difficulty was about a motor. The Board decided primarily to use the Liberty eight-cylinder (which, as is now known, has been entirely discarded); but they found that would not fit in the Bristol. Then they decided upon a certain type of French motor and then upon another type of French motor of greater power. These changes, of course, caused important changes in the machine, its balance and so on.

"Then they could not seem definitely to decide upon what sort of machine gun to use. They would order one kind, then another, then revert to the first again. This necessitated alterations in the machine proper and alterations in the gun mounts. Then a certain sort of instrument would be ordered, abandoned, and another type ordered and abandoned. We never knew where we were—and here was a force of 11,000 literally straining at the leash, ready to give all their strength and skill to the job of fast production.

*"It is no trick to turn out aeroplanes by the thousands. * * * But we can't fight with designs; we have to fight with actual planes."*

Washington tells us that the aeroplane situation is beginning to improve; that it will not be long now before we are turning out battle planes and sending them to Europe. It is about time. If the United States can build a million and a half automobiles a year, it surely can build enough fighting aircraft to break up that control of the air over the American sectors in France which the Germans now possess!

THE NEWS OF THE WEEK

Brig.-General Kenly on Air Tour of Flying Fields

Brigadier General William S. Kenly, the newly appointed chief of the Division of Military Aeronautics, who has been flying from aviation camp to aviation camp inspecting the camps, familiarizing himself with existing conditions and testing the flying qualities of aeroplanes, arrived at Mineola, April 27, having made a non-stop flight from Washington.

General Kenly started from the Capitol at 1:45 in the 450 h.p. Italian Caproni biplane, which has been flying daily in New York, Philadelphia and Washington for the past month to create interest in the Liberty Loan. With the General was his son, Lieutenant Kenly. Captain Silvio Resnati, the famous Italian aviator, was the pilot, and Captain Hugo D'Annunzio, the noted Italian aeronautic engineer, son of the famous poet, was the reserve pilot.

They started from the Polo Grounds, a few minutes from the White House, and left the Capitol at a height of 3,000 feet. Then they rose to 6,000 feet to get above the low clouds which were below them for most of the way. The wind was against them and cut down the speed of the machine considerably. They arrived at Mineola at 5 o'clock, having taken three hours and fifteen minutes to cover the distance between the Capitol and New York.

The General, as well as Captains Resnati and D'Annunzio and Lieutenant Kenly said it was a pleasant flight throughout. On April 28, General Kenly with the other officers flew from Washington to Philadelphia and back to Washington to test the flying qualities of this type of Caproni warplane, which is being used extensively by the Italians for bombing raids, and to make a quick aerial survey of the landing place selected at Philadelphia for the military aeroplanes that will carry the mail in a few weeks between New York, Philadelphia and Washington. The trip was made in three and a half hours, making a total of close to seven hours of flying General Kenly has had in two days.

Signal Corps Requires Draftsmen

In a statement authorized by the Civil Service Commission, the following appears:

"The Signal Corps of the Army is short of aeronautical mechanical draftsmen. The Navy has an unlimited number of places for draftsmen of various kinds and for a long list of technical workers.

Government Financial Co-operation

The War Finance Corporation which has been established by Congress to finance corporations doing war business will soon be ready to commence operations. Section 9 of the text of the Act creating the War Finance Corporation is as follows:

Sec. 9. That the Corporation shall be empowered and authorized, in exceptional cases, to make advances directly to any person, firm, corporation, or association, conducting an established and going business in the United States, whose operations shall be necessary or contributory to the prosecution of the war (but only for the purpose of conducting such business in the United States and only when in the opinion of the board of directors of the Corporation such person, firm, corporation, or association is unable to obtain funds upon reasonable terms through banking channels or from the general public), for periods not exceeding five years from the respective dates of such advances, upon such terms, and subject to such rules and regulations as may be prescribed by the board of directors of the Corporation. In no case shall the aggregate amount of the advances made under this section exceed at any one time an amount equal to twelve and one-half per centum of the sum of (1) the authorized capital stock of the Corporation plus (2) the aggregate amount of bonds of the Corporation authorized to be outstanding at any one time when the capital stock is fully paid in. Every such advance shall be secured by adequate security of such character as shall be prescribed by the board of directors of a value at the time of such advance (as estimated and determined by the board of directors), equal to (except in case of an advance made to a railroad in the possession and control of the President, for the purpose of making additions, betterments or road extensions of such railroad) at least one hundred and twenty-five per centum of the amount advanced by the Corporation. The Corporation shall retain power to require additional security at any time. The rate of interest charged on any such advance shall not be less than one per centum per annum in excess of the rate of discount for ninety-day commercial paper prevailing at the time of such advance at the Federal reserve bank of the district in which the borrower is located.

Major Thaw an "Ace" with 5th Air Victory

Paris, April 24.—Major William Thaw, commanding the Lafayette Flying Corps, is now counted among the "aces" in aviation in France, having brought down his fifth adversary and a captive balloon on the same day, April 20.

Major Thaw within the past month has accounted for three opponents in aerial encounters.

A dispatch from Paris relating to the exploits of American aviators says:

"The *Petit Parisien* gives dates concerning the most recent exploits of the American aviators. On April 20 Major Thaw, commander of the Lafayette Squadron, won a splendid double victory, bringing down in turn a Drachen and a monoplane. These two victories permit him to be enrolled among the prize aviators.

"Since he assumed the command of the glorious unit, he seems to have particularly distinguished himself. Major Thaw evidently wishes to set an example, and many of his compatriots will take their places within a short time among the air champions, notably Captain Biddle, Lieutenant Baer (nine victories, four of which were official in the space of forty-three days), and Sergeant Bylies. Meanwhile two Americans already have taken precedence of them, Major Lufbery and Major Thaw."

Lufbery Brings Down His 18th German Aero

Paris, April 25.—Major Raoul Lufbery, of Wallingford, Conn., destroyed his eighteenth German aeroplane on April 23rd, and Lieutenant Paul Frank Baer, of Mobile, Ala., brought down his fifth German machine on the same day, thus becoming the latest American ace. Besides the machines he is officially reported to have destroyed, Baer is believed to have brought down two other German machines. His seven victories have been scored in the past six weeks.

The semi-official count of victories won by American aviators in the French and American service now shows a total of forty during the past two months.

Two Fly from Mineola to Washington and Return in Day

Announcement was made at the Aero Club that a new American record for cross-country flying with two flyers was set on April 23 by Major Joseph Tulasne, the chief of the French aviation mission to the United States, and Lieutenant George Flachaire, the French ace, who flew to Washington for lunch and returned to New York for dinner. The flyers started from the Mineola field at 9 o'clock and they landed back on the field at 6 o'clock the same night.

It was the first aero round trip between Mineola and Washington and the longest distance covered in the United States in one day by two men in one machine. It was announced the machine made more than 500 miles.

The two famous French birdmen made the flight in a Breguet bombing biplane equipped with a 300-horsepower Renault motor. Before making their start they circled over Long Island in order to attain a height of 8,000 feet. They arrived at the Capitol at quarter past 12 o'clock. They landed on the Polo Ground. After having lunch they started on their return trip at 3 o'clock. They arrived at Mineola three hours later. Both flights were made at a height of about 6,000 feet.

Lord Rothermere Quits as British Air Minister

London, April 25.—Lord Rothermere has resigned as Air Minister and President of the recently organized Supreme Air Council.

It is expected that Sir William Weir, Director General of Aircraft Production, will succeed him.

In a letter to Prime Minister Lloyd George tendering his resignation Lord Rothermere explained that the burden of his work and responsibility has seemed crushing in consequence of his great distress of mind and body caused by illness

Scene at a Naval Station, "Somewhere in America," showing fifteen planes on beach departing and arriving.

© Committee on Public Information.

and his "second tragic loss in the war." His second son, Lieutenant Vere Sydney Harmsworth, was killed in battle in November, 1916, and his eldest son, Lieutenant Harold Alfred Harmsworth, was killed in action last winter. Lord Rothermere wrote the Premier that he had felt it his duty to remain at his post until the two air services, army and navy, were consolidated, which has now been successfully accomplished, and recently he had hoped to continue in office, but this has been prevented by recurrence of illness.

Premier Lloyd George replied that he received the resignation with deepest regret. He eulogized Lord Rothermere for his work, expressed sympathy on account of his losses, and concluded: "I am authorized by my colleagues to state that they share fully the views expressed in this letter."

Lord Rothermere's resignation surprised the political world. It had been announced that illness made it impossible for him to reply in the debate which Lord Sydenham intended to begin last Tuesday in the House of Lords in regard to the resignation of Major General Trenchard as Chief of the Air Staff and Major General Sir David Henderson as Director General of Military Aeronautics, but no one outside the Cabinet knew that Rothermere's condition was so serious as to make his resignation necessary.

Lord Rothermere has been criticised severely by some newspapers for running counter to General Trenchard and General Henderson, both of whom have done great work for the air service. This criticism grew more severe when it became known to-day that the financial adviser of the Air Ministry, who joined it at Lord Rothermere's request, also had resigned owing to disagreement with his chief's policy. What the differences were has not been disclosed.

Seaplane Makes Record on Flight

San Diego.—A seaplane, piloted by Malcolm Loughead and carrying three passengers, arrived here at 12:23 on April 12.

The F-1 left Santa Barbara at 9:21 this morning and the estimated distance of 190 miles between that city and San Diego was therefore covered in exactly three hours and two minutes, a speed of approximately 63⅓ miles an hour. The big seaplane was first sighted over Point Loma and within a few minutes alighted on the surface of San Diego Bay a short distance from the United States army aviation station at North Island. At 12:23 the seaplane reached the North Island landing and was hauled ashore by army men in waiting. According to Pilot Loughead, the trip was made without incident, although during the latter part of the trip head winds were met with which retarded the speed of the aircraft.

The seaplane was constructed by the Loughead Aircraft Company, of Santa Barbara, Cal.

Miss Stinson and Miss Law Have Aeroplane Race

Miss Katherine Stinson and Miss Ruth Law will have an aeroplane race at Sheepshead Bay Speedway on Memorial Day, May 30, on the occasion of the Harkness Handicap 100-mile race.

Flying Over Washington

Colonel Lee, of the British flying mission, in an Avro fighting plane, and Captain Silvio Resnati, the Italian airman, entertained Washington with some remarkable exhibition flying during the past week. On April 24 both fliers were in evidence.

While Colonel Lee slipped, slid, looped, twisted, turned, dodged, fell, dived and spun over the Potomac Park Aerodrome and the downtown section of the city in his trim little machine, the Italian guided his huge engine of death in great circles and figure eights all over the city, barely skimming the house and tree tops, and at times seeming so close to them that disaster apparently was inevitable.

Captain Resnati did stunts while the British tank Britannia entertained huge throngs in Rock Creek Park. Circling over the park, he dropped thousands of Liberty Loan leaflets, while the crew of the tank was putting that engine of destruction through its war paces. It was a startling combination show of the new war as waged on land and in the air.

Miss Ruth Law dropped Liberty Loan literature over Washington on Liberty Day.

Major-General F. H. Sykes, who has been appointed Chief of the London Air Staff, replacing Major-General Trenchard, retired
© Press Illustrated Service.

Mr. Baker Tells Senate Committee of His Trip

Information gathered by Secretary Baker on his recent visit to Europe was given to the Senate Military Affairs Committee on April 24. Like the hearing yesterday before the House committee, to-day's conference was behind closed doors, and several Senators not on the committee attended.

Secretary Baker was with the committee less than an hour. Plans for expansion of Army or draft legislation were not discussed. The Secretary said he was not yet ready to present those subjects, but after the hearing he took occasion to deny reports that President Wilson is "holding up" the Army expansion program.

Nice-Paris-London Air Line

Washington, April 26.—An aerial line between Nice, Paris and London is to be established soon, says a dispatch to-day from Rome. Italy has started an enormous industrial expansion looking to the development of aviation, according to an Associated Press dispatch.

Aircraft Board Pays Tribute to Bolling

Washington, April 26.—Resolutions in recognition of the distinguished service given to the nation by Colonel Raynal C. Bolling, killed in France, were made public to-day by the Aircraft Board, as follows:

"Colonel Raynal C. Bolling, Signal Corps, United States Army, was killed by the enemy on a battlefield in France in the performance of his duty. Colonel Bolling was a member of the Aircraft Production Board and rendered distinguished service to his country as a member of a mission to Europe to negotiate important military matters between the United States and Allied Governments. His high motives, brilliant attainments and unfailing devotion rendered his work of inestimable value to his country and deepens the sense of personal loss to the members of this board.

"Be it resolved, therefore, that this statement be spread upon the minutes of the board, and a copy of the same be sent to his family as a brief memorial to the brave gentleman and gallant soldier, Raynal C. Bolling, Colonel, Signal Corps, United States Army, killed in action in the defence of his country and in the cause of liberty among the nations of the world."

A German Fokker monoplane exhibited at "Liberty Land" at the 69th Regt. Armory, New York City

339 Enemy Aeroplanes Downed By Lafayettes

WASHINGTON, April 26.—American aviators in France had downed 339 enemy planes from the time the United States entered the war up to March 8, according to unofficial reports from France.

Many more than this number were actually downed, but were not counted officially for various reasons.

Sir Weir Head of British Air Force

LONDON, April 26.—Sir William Weir has been appointed Minister of the Air Forces in succession to Lord Rothermere, brother of Lord Northcliffe, who resigned.

Sir William Weir has been Director-General of Aircraft Production. He was born in 1877, and has been in the aeronautical service since last year. Formerly he was Scottish Director of Munitions.

Italian Sets New World's Record at Washington

WASHINGTON.—Sergeant Gianfelice Gino, of the Italian Flying Corps, established on April 26th what is said to be a new world's record for speed when he flew from Langley Field, Hampton Roads, Va., to Washington in a Spa fighting plane in one hour. The distance is 145 miles. He left Hampton Roads at 12:30 and arrived in Washington at 1:30.

German Aeroplanes Exhibited at 69th Regt. Armory

Numerous war exhibits, including three captured German aeroplanes, are to be seen at "Liberty Land," at the 69th Regiment Armory, New York City. These attractions are displayed under the direction of the Liberty Loan Committee, the United States Treasury Department, and the War Commissions of France, Great Britain and Italy.

The most interesting machine is a large Aviatik biplane, a German Type C "General Utility" aeroplane which is in a fair state of preservation. It is one of the more recent machines, having a 6-cylinder 22 H.P. Benz engine.

The remains of an Albatros Hydro-aeroplane show the effects of a severe "straffing," but an idea of the construction can be formed from its inspection. A Fokker monoplane, captured by the British, is also shown. Some of the fuselage fabric is torn off, revealing the interior framework which is entirely of steel tubing with welded joints. The fact that this monoplane at one time held unquestioned mastery of the air in the sectors at which it first appeared, makes it a prominent part of the exhibit.

The display of aerial bombs,, part of a Zeppelin framework and various types of machine guns attract the attention of those interested in war in the air. Among the hundreds of official war photographs covering the four walls of the armory are many avation pictures.

"Liberty Land" was formally opened to the public on April 13th, and continue until May 4th. The 69th Regiment Armory is on Lexington Avenue at 25th Street, New York City.

Navy Flying Uniform

Changes in Uniform Regulations, U. S. Navy,
1913. *No. —, April* 1, 1918.
Navy Dept., Office of Naval Operations,
Washington, D. C.

The following service flying uniform for officers detailed for aviation duty and officers of the Naval Reserve Flying Corps is prescribed. This uniform will also be worn by student officers with the exception as enumerated in paragraph under student officers. This cancels Changes in Uniform Regulations, U. S. Navy, 1913, Nos. 11, 12 and 14:

WINTER FLIGHT SERVICE

Coat.—To be of same pattern as white service coat, Uniform Regulations, U. S. Navy, except that on the front there shall be four patch pockets of the same material as the coat, the two upper pockets being on the breast on each side, 7 inches deep and 6 niches wide, in side measurements, and vertically pleated down the center by a pleat 1½ inches wide, the top of these pockets being on a horizontal line 1 inch below the points of the shoulder; the upper pockets shall be closed by flaps of the same width as the pockets and

(*Continued on page* 414)

THE NEW PERSONNEL IN CHARGE OF AIRCRAFT PROGRAM

As related on the editorial pages of this issue Aerial Age, important changes have been made in the departments responsible for the aeronautic branch of our army services.

Mr. John D. Ryan

Mr. John D. Ryan, the new Director of Aircraft Production, one of the country's foremost business organizers and industrial mobilizers, is best known for his work in connection with the world's greatest copper corporation, the Anaconda Copper Company, of which he is president. His reputation as a leader in the financial world was founded chiefly on the remarkable managing ability displayed in the formation of the Anaconda company, though his interests in a string of banks and in Western railroad electrification work are equally important.

John D. Ryan, the new head of Aircraft Production

In the last year, however, Mr. Ryan has been continuously in the Government service, first as Director General of Military Relief of the Red Cross and later as an adviser of the War Industries Board. He is ranked as the leading copper authority in the United States and at the time Daniel Willard resigned the chairmanship of the War Industries Board, Mr. Ryan was mentioned as his successor.

His Red Cross work was voluntary, and he had complete supervision of maintaining the base hospitals at home cantonments and in military camps abroad.

The story of the rise of the latest industrial executive to command one of the important branches of military equipment dates back to days when corporations were viewed with popular suspicion of governmental disapproval, and his elevation to the presidency of the old Amalgamated Copper Company in 1909, of which he had been managing director, marked the turning point in the stormy career of this gigantic corporation. Under the regime of H. H. Rogers, whom he succeeded, the Amalgamated company was classed as the copper octopus, and one of Mr. Ryan's first official acts was to submerge the muckraked corporation in the concern now known as the Anaconda, which at that time was a subsidiary of the Amalgamated.

His experience in the mining regions of Montana, where he had managed the local affairs of the Amalgamated Copper Company before coming East, fitted him for the task of revamping the greatest copper mining company in the United States.

Mr. Ryan's ability for efficient organization expanded beyond the realm of the copper industry and a few years ago he undertook the management of the Montana Power Company, which has developed into a power corporation supplying current for more than 500 miles of railroad in the West.

Through investments in mining enterprises in South America, notably in Chile, Mr. Ryan became heavily interested in a number of properties there, which have since helped swell the Anaconda's profits in recent years.

In addition to his activities in copper corporations, his banking and railroad connections include directorships in the following: Guaranty Trust Company, Mechanics and Metals National Bank, Emigrant Industrial Savings Bank, American Surety Company, Chicago, Milwaukee and St. Paul Railway, Montana Power Company, and the United Metals Selling Company.

Mr. Ryan was born at Hancock, Mich., October 10, 1864, and when 32 married Miss Nettie Gardner of his native town.

Brigadier-General Kenly

Brig. Gen. William L. Kenly, who is to head the new division of military aeronautics, has been attached to Gen. Pershing's staff in France and only recently returned to the United States. He will look after the training of aviators and the military use of aircraft. The personnel of this division will be announced in a few days.

Brig. Gen. Kenly was the first officer of the line to undertake the course in aeronautics in the summer of 1916, and during the past few weeks he has been making a tour of the aviation field by air route, becoming familiar with existing conditions and getting an opportunity to study the various types of aeroplanes and their respective merits. His sound, practical knowledge well qualifies him for the gigantic task with which the President has entrusted him.

William C. Potter

Mr. William C. Potter is head of the Equipment Division of the Signal Corps. He comes from Massachusetts, colonial stock, the family having settled in Ipswich in 1635. One of his antecedents was John Potter, a lieutenant in the Revolutionary Army. His father, Edwin Augustus Potter, a former president of the Continental and Commercial Bank of Chicago, now resides at Lake Geneva, Wis.

Mr. Potter is a graduate of the Greenwood Avenue Public School of Chicago, the Chicago Manual Training School and the Massachusetts Institute of Technology in 1897. He holds the degree of M.E. and A.B.

In 1898 he entered the employment of the Liberty Bell Gold Mining Co. of Telluride, Col., going the next year to Libby Creek, Mont., as a mill foreman. Then he entered the employment of the Atchison & Sante Fe Railway as a mining engineer in the Industrial Department.

In 1902 he became a member of the firm of Dickman, McKenzie & Potter of Chicago, but in 1903 he took the management of the Guggenheim Exploration Co. in the City of Mexico. From 1905 to 1911 he was general manager of the Southern Department of the American Smelting & Refining Co., with headquarters at Aguascalientes, Mexico.

William C. Potter, in charge of the Equipment Division of the Signal Corps

Next he was made president of the Intercontinental Rubber Co. of New York. He resigned to accept the first vice-presidency of the Guaranty Trust Co. of this city in 1812, relinquishing this position in 1916 to join the firm of Guggenheim Bros., 120 Broadway. He became president of the Braden Co. and vice-president of the Chile Exploration Co.

On January 2, 1918, he entered the service of the Government in the Equipment Division of the Signal Corps, and, naturally, is familiar with the present perplexing aircraft production situation.

Brigadier-General William L. Kenly, in charge of the Division of Military Aeronautics

Mr. Potter was married in Chicago in 1902, his bride being Miss Caroline Morton, daughter of the late Paul Morton, former Secretary of the Navy, and later president of the Equitable Life Assurance Society. They have two daughters, Jean and Charlotte. Charles H. Sabin, president of the Guaranty Trust Co. of this city, is his brother-in-law.

Among his clubs are the Links, Metropolitan, National Golf Links, Shinnecock Hills Golf, Racquet and Tennis, Piping Rock, Rocky Mountain, Bankers' Club of America, Recess and the Club of Royal Game.

By his associates Mr. Potter is regarded as eminently qualified to carry out successfully any undertaking to which he may be assigned by the Government.

Aeroplanes at Columbia for New War Activity

New York, April 27.—Three aeroplanes marked with the French tri-color, seen in a quiet corner of the Columbia University campus, were the first evidences of a new war activity of the university, the establishment of a United States Signal Corps Radio School. A statement announcing the opening of the new school was issued by Dr. G. B. Pegram, acting dean of the faculty of applied sciences.

Armed guards kept back a crowd which gathered near the machines, which are Curtiss training aeroplanes with the motors removed. They will serve as "dummies" for practice in aerial wireless by men of the Signal Corps Radio Schoo.l

One hundred and fifty students are expected to arrive soon to begin training in the radio school. They will be taught the use of wireless apparatus in aeroplanes and other branches of signal work.

NOMENCLATURE FOR AERONAUTICS

By the NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

FOR the information of those interested in aeronautics the following nomenclature has been prepared as a guide, with a view to eliminate the duplication of terms, the erroneous use of terms, and confusion of terms, and to define the principal terms which have come into use in the development of aeronautics. In the preparation of this nomenclature only those terms have been defined which are peculiar to this subject.

Aerofoil: A winglike structure, flat or curved, designed to obtain reaction upon its surface from the air through which it moves.

Aeroplanes: See Aeroplane.

Aileron: A movable auxiliary surface used to produce a rolling moment about the fore-and-aft axis.

Aircraft: Any form of craft designed for the navigation of the air—aeroplanes, balloons, dirigibles, helicopters, kites, kite balloons, ornithopters, gliders, etc.

Aeroplane: A form of aircraft heavier than air which has wing surfaces for support in the air, with stabilizing surfaces, rudders for steering, and power plant for propulsion through the air. This term is commonly used in a more restricted sense to refer to airplanes fitted with landing gear suited to operation from the land. If the landing gear is suited to operation from the water, the term "seaplane" is used. (See definition.)

Pusher.—A type of aeroplane with the propeller in the rear of the engine.

Tractor.—A type of aeroplane with the propeller in front of the engine.

Air-speed meter: An instrument designed to measure the speed of an aircraft with reference to the air.

Altimeter: An aneroid mounted on an aircraft to indicate continuously its height above the surface of the earth.

Anemometer: Any instrument for measuring the velocity of the wind.

Angle:

Of attack or *of incidence of an aerofoil.*—The acute angle between the direction of the relative wind and the chord of an aerofoil; i. e., the angle between the chord of an aerofoil and its motion relative to the air. (This definition may be extended to any body having an axis.)

Critical.—The angle of attack at which the lift-curve has its first maximum; sometimes referred to as the "burble point." (If the "lift curve" has more than one maximum, this refers to the first one.)

Gliding.—The angle the flight path makes with the horizontal when flying in still air under the influence of gravity alone, i. e., without power from the engine.

Appendix: The hose at the bottom of a balloon used for inflation. In the case of a spherical balloon it also serves for equalization of pressure.

Aspect ratio: The ratio of span to chord of an aerofoil.

Aviator: The operator or pilot of heavier-than-air craft. This term is applied regardless of the sex of the operator.

Axles of an aircraft: Three fixed lines of reference; usually centroidal and mutually rectangular.

The principal longitudinal axis is the plane of symmetry, usually parallel to the axis of the propeller, is called the fore and aft axis (or longitudinal axis); the axis perpendicular to this in the plane of symmetry is called the vertical axis; and the third axis, perpendicular to the other two, is called the transverse axis (or lateral axis). In mathematical discussions the first of these axes, drawn from front to rear, is called the X axis; the second, drawn upward, the Z axis; and the third, forming a "left-handed" system, the Y axis.

Balancing Flaps: See Aileron.

Ballonet: A small balloon within the interior of a balloon or dirigible for the purpose of controlling the ascent or descent, and for maintaining pressure on the outer envelope so as to prevent deformation. The ballonet is kept inflated with air at the required pressure, under the control of a blower and valves.

Balloon: A form of aircraft comprising a gas bag and a basket. The support in the air results from the buoyancy of the air displaced by the gas bag, the form of which is maintained by the pressure of a contained gas lighter than air.

Barrage.—A small spherical captive balloon, raised as a protection against attacks by aeroplanes.

Captice.—A balloon restrained from free flight by means of a cable attaching it to the earth.

Kite.—An elongated form of captive balloon, fitted with tail appendages to keep it headed into the wind, and deriving increased lift due to its axis being inclined to the wind.

Pilot.—A small spherical balloon sent up to show the direction of the wind.

Sounding.—A small spherical balloon sent aloft, without passengers, but with registering meteorological instruments.

Balloon bed: A mooring place on the ground for a captive balloon.

Balloon cloth: The cloth, usually cotton, of which balloon fabrics are made.

Balloon fabric: The finished material, usually rubberized, of which balloon envelopes are made.

Bank: To incline an aeroplane laterally—i. e., to roll it about the fore and aft axis. Right bank is to incline the aeroplane with the right wing down. Also used as a noun to describe the position of an aeroplane when its lateral axis is inclined to the horizontal.

Barograph: An instrument used to record variations in barometric pressure. In aeronautics the charts on which the records are made indicate altitudes directly instead of barometric pressures.

Basket: The car suspended beneath a balloon, for passengers, ballast, etc.

Biplane: A form of aeroplane in which the main supporting surface is divided into two parts, one above the other.

Body of an Aeroplane: The structure which contains the power plant, fuel, passengers, etc.

Bonnet: The appliance, having the form of a parasol, which protects the valve of a spherical balloon against rain.

Bridle: The system of attachment of cable to a balloon, including lines to the suspension band.

Bullseyes: Small rings of wood, metal, etc., forming part of balloon rigging, used for connection or adjustment of ropes.

Burble point: See Angle, critical.

Cabane: A pyramidal framework upon the wing of an airplane, to which stays, etc., are secured.

Camber: The convexity or rise of the curve of an aerofoil from its chord, usually expressed as the ratio of the maximum departure of the curve from the chord to the length of the chord. "Top camber" refers to the top surface of an aerofoil, and "bottom camber" to the bottom surface; "mean camber" is the mean of these two.

Capacity: See Load.

The cubic contents of a balloon.

Center: *Of pressure of an aerofoil.*—The point in the plane of the chords of an aerofoil, prolonged if necessary, through which at any given attitude the line of action of the resultant air force passes. (This definition may be extended to any body.)

Chord:

Of an aerofoil section.—A right line tangent at the front and rear to the under curve of an aerofoil section.

Length.—The length of the chord is the length of the projection of the aerofoil section on the chord.

Clinometer: See Inclinometer.

Concentration ring: A hoop to which are attached the ropes suspending the basket.

Controls: A general term applying to the means provided for operating the devices used to control speed, direction of flight, and attitude of an aircraft.

Control column: The vertical lever by means of which certain of the principal controls are operated, usually those for pitching and rolling.

Crow's foot: A system of diverging short ropes for distributing the pull of a single rope.

Decalage: The angle between the chords of the principal and the tail planes of a monoplane. The same term may be applied to the corresponding angle between the direction of the chord or chords of a biplane and the direction of a tail plane. (This angle is also sometimes known as the longitudinal V of the two planes.)

Dihedral in an aeroplane: The angle included at the intersection of the imaginary surfaces containing the chords of the right and left wings (continued to the plane of symmetry if necessary). This angle is measured in a plane perpendicular to that intersection. The measure of the dihedral is taken as 90° minus one-half of this angle as defined.

The dihedral of the upper wing may and frequently does differ from that of the lower wing in a biplane.

Dirigible: A form of balloon, the outer envelope of which is of elongated form, provided with a propelling system, car, rudders, and stabilizing surfaces.

Nonrigid.—A dirigible whose form is maintained by the pressure of the contained gas assisted by the car-suspension system.

Rigid.—A dirigible whose form is maintained by a rigid structure contained within the envelope.

Semirigid.—A dirigible whose form is maintained by means of a rigid keel and by gas pressure.

Diving rudder: See Elevator.

Dope: A general term applied to the material used in treating the cloth surface of aeroplane members and balloons to increase strength, produce tautness, and act as a filler to maintain air-tightness; it usually has a cellulose base.

Drag: The component parallel to the relative wind of the total force on an aircraft due to the air through which it moves.

That part of the drag due to the wings is called "wing resistance" (formerly called "drift"); that due to the rest of the airplane is called "parasite resistance" (formerly called "head resistance').

Drift: See Drag. Also used as synonymous with "leeway," g. v.

Drift meter: An instrument for the measurement of the angular deviation of an aircraft from a set course, due to cross winds.

Drip cloth: A curtain around the equator of a balloon, which prevents rain from dripping into the basket.

Elevator: A hinged surface for controlling the longitudinal attitude of an aircraft; i. e., its rotation about the transverse axis.

Empannage: See Tail.

Entering edge: The foremost edge of an aerofoil or propeller blade.

Envelope: The portion of the balloon or dirigible which contains the gas.

Equator: The largest horizontal circle of a spherical balloon.

Fins: Small fixed aerofoils attached to different parts of aircraft, in order to promote stability; for example, tail fins, skid fins, etc. Fins are often adjustable. They may be either horizontal or vertical.

Flight path: The path of the center of gravity of an aircraft with reference to the earth.

Float: That portion of the landing gear of an aircraft which provides buoyancy when it is resting on the surface of the water.

Fuselage: See Body.

Gap: The shortest distance between the planes of the chords of the upper and lower wings of a biplane.

Gas bag: See Envelope.

Glide: To fly without engine power.

Glider: A form of aircraft similar to an airplane, but without any power plant.

When utilized in variable winds it makes use of the soaring principles of flight and is sometimes called a soaring machine.

Gore: One of the segments of fabric composing the envelope.

Ground cloth: Canvas placed on the ground to protect a balloon.

Guide rope: The long trailing rope attached to a spherical balloon or dirigible, to serve as a brake and as a variable ballast.

Guy: A rope, chain, wire, or rod attached to an object to guide or steady it, such as guys to wing, tail, or landing gear.

Hangar: A shed for housing balloons or airplanes.

Helicopter: A form of aircraft whose support in the air is derived from the vertical thrust of propellers.

Horn: A short arm fastened to a movable part of an airplane, serving as a lever-arm, e. g., aileron-horn, rudder-horn, elevator-horn.

Inclinometer: An instrument for measuring the angle made by any axis of an aircraft with the horizontal, often called a clinometer.

Inspection window: A small transparent window in the envelope of a balloon or in the wing of an airplane to allow inspection of the interior.

Kite: A form of aircraft without other propelling means than the towline pull, whose support is derived from the force of the wind moving past its surface.

Landing gear: The understructure of an aircraft designed to carry the load when resting on or running on the surface of the land or water.

Leading edge: See Entering edge.

Leeway: The angular deviation from a set course over the earth, due to cross currents of wind, also called drift; hence, "drift meter."

Lift: The component perpendicular to the relative wind, in a vertical plane, of the force on an aerofoil due to the air pressure caused by motion through the air.

Lift bracing: See Stay.

Load:

Dead.—The structure, power plant, and essential accessories of an aircraft.

Full.—The maximum weight which an aircraft can support in flight; the "gross weight."

Useful.—The excess of the full load over the dead-weight of the aircraft itself, i. e., over the weight of its structure, power plant, and essential accessories. (These last must be specified.)

Loading: See Wing, loading.

Lobes: Bags at the stern of an elongated balloon designed to give its directional stability.

Longeron: See Longitudinal.

Longitudinal: A fore-and-aft member of the framing of an airplane body, or of the floats, usually continuous across a number of points of support.

Monoplane: A form of aeroplane whose main supporting surface is a single wing, extending equally on each side of the body.

Mooring band: The band of tape over the top of a balloon to which are attached the mooring ropes.

Nacelle: See Body. Limited to pushers.

Net: A rigging made of ropes and twine on spherical balloons, which supports the entire load carried.

Ornithopter: A form of aircraft deriving its support and propelling force from flapping wings.

Panel: The unit piece of fabric of which the envelope is made.

Parachute: An apparatus, made like an umbrella, used to retard the descent of a falling body.

Patch system: A system of construction in which patches (or adhesive flaps) are used in place of the suspension band.

Permeability: The measure of the loss of gas by diffusion through the intact balloon fabric.

Pitot tube: A tube with an end open square to the fluid stream, used as a detector of an impact pressure. It is usually associated with a coaxial tube surrounding it, having perforations normal to the axis for indicating static pressure; or there is such a tube placed near it and parallel to it, with a closed conical end and having perforations in its side. The velocity of the fluid can be determined from the difference between the impact pressure and the static pressure, as read by a suitable gauge. This instrument is often used to determine the velocity of an aircraft through the air.

Pontoons: See Float.

Pusher: See Aeroplane.

Pylon: A mast or pillar serving as a marker of a course.

Race of a propeller: See Slip stream.

Relative wind: The motion of the air with reference to a moving body. Its direction and velocity, therefore, are found by adding two vectors, one being the velocity of the air with reference to the earth, the other being equal and opposite to the velocity of the body with reference to the earth.

Rip cord: The rope running from the rip panel of a balloon to the basket, the pulling of which causes immediate deflation.

Rip panel: A strip in the upper part of a balloon which is torn off when immediate deflation is desired.

Rudder: A hinged or pivoted surface, usually more or less flat or stream lined, used for the purpose of controlling the attitude of an aircraft about its "vertical" axis, i. e., for controlling its lateral movement.

Rudder bar.—The foot bar by means of which the rudder is operated.

Seaplane: A particular form of airplane in which the landing gear is suited to operation from the water.

Serpent: A short, heavy guide rope.

Side slipping: Sliding downward and inward when making a turn; due to excessive banking. It is the opposite of skidding.

Skidding: Sliding sideways away from the center of the turn in flight. It is usually caused by insufficient banking in a turn, and is the opposite of side slipping.

Skids: Long wooden or metal runners designed to prevent nosing of a land machine when landing or to prevent dropping into holes or ditches in rough ground. Generally designed to function should the landing gear collapse or fail to act.

Slip stream or propeller race: The stream of air driven aft by the propeller and with a velocity relative to the aeroplane greater than that of the surrounding body of still air.

Soaring machine: See Glider.

(*Continued on page* 411)

THE USE OF JIGS, FIXTURES, GAUGES AND TOOLS IN AEROPLANE MANUFACTURE

By R. BORLASE MATTHEWS, WH. EX., A.M.I.C.E., M.I.E.E.E., F.AE.S.

Editorial Introduction

JIGS, tools and gauges, and the machinery with which to make them, are most important factors in the production of aircraft and engines.

The following article, the first of its kind ever published, is the substance of a lecture delivered by the author at the Royal Society of Arts, in London, England. Lieutenant Colonel Sir Henry Fowler, K. B. E., Assistant Director General of Aircraft Production of the British Government, presided. It was followed by expressions of opinions from leading British aircraft manufacturers and military and naval aeronautic engineers.

Introductory

A new industry calls for new methods—*autres jours, autres mœurs*—and the aeroplane industry is therefore not exceptional in demanding many departures from recognized woodworking practice. In the first place the number of machines required today is so large that their construction should be described as a manufacturing rather than a building operation. That is to say, they should preferably be almost entirely put together by the aid of accurate machinery instead of being dependent to such an extent upon the skill of the individual workman, in trying and fitting one part to another until the whole is built up. In this connection it may be remarked that the design of the metal fittings for aeroplanes is not such as to call for any radical departure from previous high class small metal working practice. It is the woodworking side of the business which presents the new scope for initiative. It is this latter aspect, therefore, which will be considered here.

The underlying ideal of the modernized system now advocated, is, that the arrangement of the work and the facilities for economically carrying it out should be planned and designed in the office as distinct from the shops where the actual work is done. For a great number of years it has been realized in engineering establishments that drawings are essential and economical, likewise sooner or later it will be appreciated that drawings of jigs and fixtures are just as necessary.

It may be mentioned in passing, that since the subject is treated as a whole, all the points raised, would obviously not necessarily be applied to the manufacture of one particular type of machine, as so much depends upon circumstances, the size of the order, the probabilities of modifications in design during progress, etc.

Definition of Jigs and Fixtures

The distinction between a jig and a fixture is not an easy one to define, as it is difficult to say where one ends and the other begins. A jig is a device which either holds, or is held on to the work, and at the same time incorporates guides for the various cutting tools; whereas a fixture holds the work while the cutting tools are in operation, but does not contain any special arrangements for guiding the cutting tools. In other words, a fixture is usually a device which must be entirely held or fixed to the machine on which the operation is preformed. The term fixture is often, however, also applied to assembling arrangements of larger size, which form complete units in themselves and are generally permanently attached to concrete foundations. Gauges must, of course, not be confounded with jigs.

A Comparison Between Engine and Aeroplane Manufacture

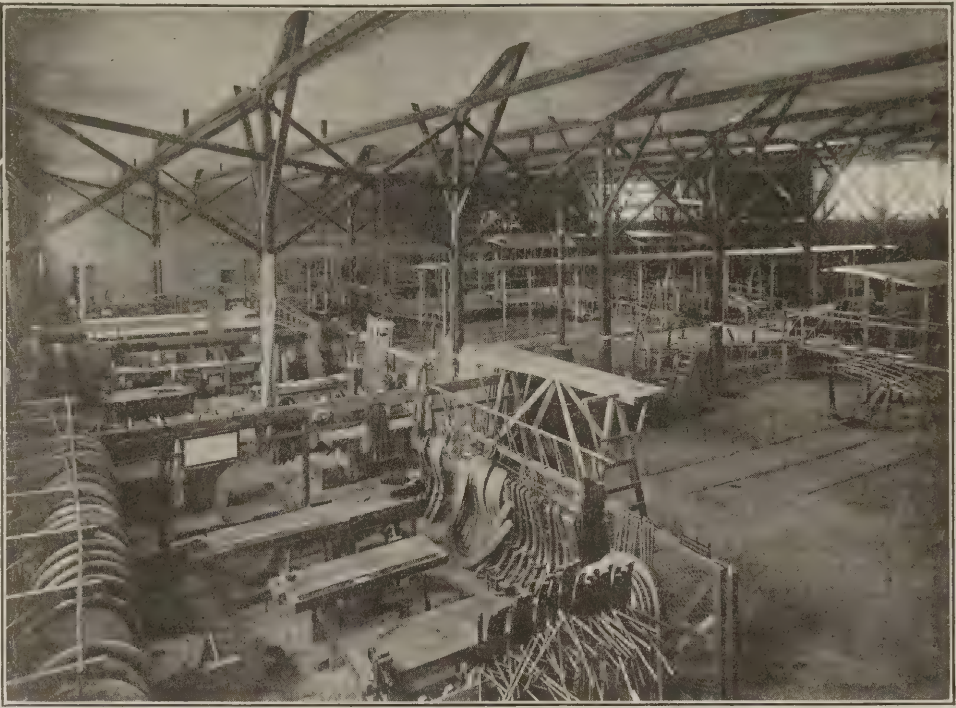
In manufacturing engines in quantities it has long been the practice to use jigs and fixtures in order to speed up production and also to ensure correctness of output. But up to the present, in aeroplane manufacture, this practice has not been adopted to such an extent as it might have been, with the result that it takes very much longer to turn out an aeroplane than is necessary. This delay arises, boh in production of detail parts and also in the assembly of units and complete machines.

Erecting and testing one of the huge Caproni triplanes at the Caproni factory in Italy. In the group on the right, in uniform, is Lieut. Hugo D'Annunzio, in charge of the factory

Considerable time is lost throughout, in trying and fitting the parts into their correct relation, owing to errors in making the details.

For example, assume that in an engine two parts are required to be bolted together. These parts are not clamped together and then drilled both at the same time, nor is one part drilled and the other clamped up to it and drilled through the first. Both parts are drilled separately in jigs. This may be done in a separate department, or even in a separate factory, and still the parts will bolt together in their correct relation.

But in the majority of aeroplane works quite a different state of affairs exists. Take, for example, the case of spars which have to have metal brackets attached to clamp up to other parts. Here the metal parts are placed over the spars when they have been put in position relative to other parts. The spar is then drilled through holes already drilled in the metal parts. This entails much difficulty, because the job is inaccessible; it also promotes inaccuracy, owing to the operator having to drill from both sides to ensure that there will be a clear way for the bolts through both sides. All this troublesome work and subsequent delay would be avoided were the spars and metal parts drilled in jigs. All that would then be necessary would be to push through the bolts and tighten up.


Storage room for dissembled landing chassis at one of the leading Allied aircraft factories. (Official Photo.)

Again, take the spindling of spars. For the sake of compariosn, the milling of straight metal parts may be considered, when the work travels on a horizontal table against the cutter. Here the length to be machined is controlled by stops. In the spindling of spars the job should be placed in a jig having stops upon it, so that it is impossible for the cutter to operate except where it is so desired. By proper design of the jig, the cut out portions will come in correct relation to the overall length and depth.

In cutting form or taper shapes, as, for example, the nose pieces on rotary engines, forming plates are used to compel the tool and the work to move in such a manner that the desired finished form is arrived at. This principle might well be adopted in woodworking, when parts have to be spindled to some special form or taper. The jig would be made with a "former" for bearing against the spindle, which will only allow the cutter to operate in such a way as to produce the desired shape.

The "former" idea should be extended to cover work on the band saw, either for roughing to shape or for finished work when the saw finish is good enough.

For the use of such "forming" jigs on spindling machines, the "former" should bear against a ball bearing embracing the spindle. This will very much reduce the wear on the "former" and so ensure a much longer life for the jig as regards accuracy.

Of course, these "formers" entirely do away with the necessity for marking out shapes, entailing, as the latter operation does, a great amount of time.

The various units that go to make up a complete machine should be assembled in a jig. The jig should hold each unit by at least two locating points. The units, when held in the jig, will all come into their correct relative positions. All that will then have to be done will be to bolt up, through holes drilled in jigs used for making the parts.

Careful consideration as to the cost of production must be given before setting about the design of a jig or fixture, as obviously it is absurd if the cost of the jig is in excess of the anticipated gain. The only exception that would permit of the employment of a jig, which did not comply with the above conditions, is where accuracy of parts is of such importance as to make interchangeability of these parts absolutely essential.

Time and Cost Saved by Use of Jigs

As an illustration of time saving, many aeroplanes could be made in three-fifths of the present time required, if proper jigs and fixtures were in existence. The cost would be reduced by something like twenty-five per cent, this estimate

Preparing Caproni triplane for the mounting of their Fiat, or Isotta-Fraschini motors. (Italian Official Photo.)

being based upon a small number of machines, say 250. On a larger number, say 1,000, the saving in labor would be about fifty per cent, and naturally the saving in labor means increased speed in production.

As a detail example of economy the elevator of a certain machine used to cost in labor alone £2 10s. 0d.; this was immediately reduced to under a sovereign on the introduction of proper jigs. Many other similar cases could be cited.

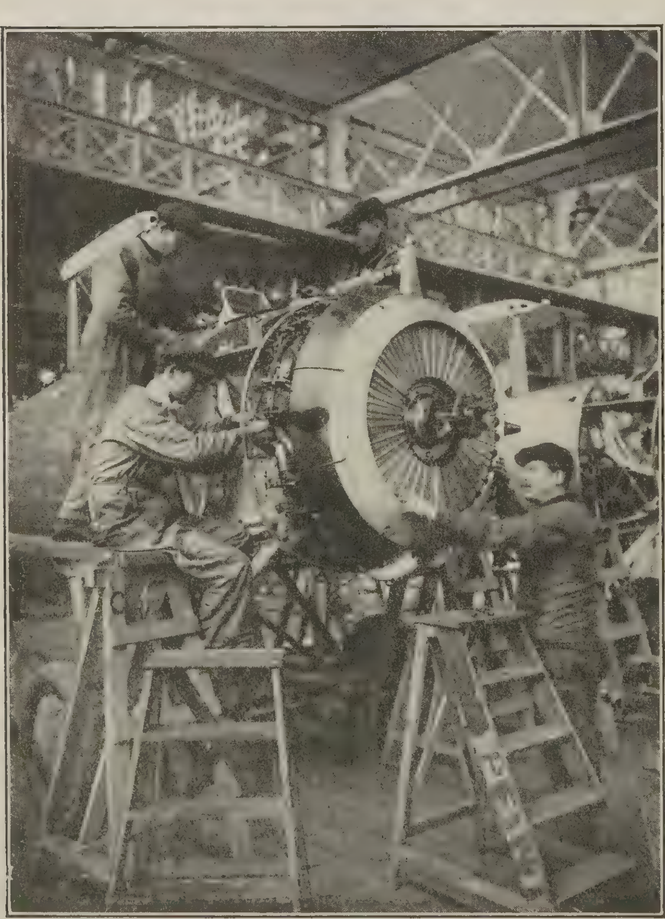
Jig and Fixture Drawings

A modern aeroplane requires at least 1,200 jigs and fixtures. It is obvious that to make so large a number with accuracy, and to ensure that the right number are ordered, these jigs should be made to drawings. At present the comparatively few jigs that are employed are, as a rule, made to the shop foreman's more or less crude ideas. It therefore follows, that when some machine or parts of machines are made by more than one sub-contractor, there will, assuming all sub-contractors work to jigs, be as many different types or styles of jigs to do the same job. Each of these different jigs, to do the same jog, is the result of separate thought.

Here, obviously, is an opportunity for economizing time, for if the jig had been properly designed in a drawing office, all that would have been necessary would have been to have sent a copy of the jig drawing to all sub-contractors, who would then have made their jigs without wasting time in thought and consideration.

The Need of Organized Design

In accordance with well tried principles, sometimes known in the aggregate as Taylorism (out of compliment to the original investigator), it is clear that if work is to be carried out according to scientific laws, the management must be so organized as to execute itself much of the planning formerly left to the initiative of the individual workman. The older method of works management has been described as that of "initiative and incentive," the underlying philosophy of which necessarily leaves the detail solution of daily problems to the man at the bench. The incentive offered in this way, in return for initiative, is merely monetary reward. The method is faulty, because the workman's whole time should be actually taken in doing work with is hands. Even if he had the necessary education and habits of generalization in his thought, he lacks the time and the opportunity for the development of the underlying scientific principles, and without these much effort can be frittered away. Again, any actual development of applications by an individual worker is not easily disseminated amongst others. Under scientific management exact scientific knowledge and methods must earlier or later replace rule-of-thumb ways everywhere. It may be fairly stated that the days have passed when an individual man of strong personality can do big things without the assistance of others. Rather, the present age is one of co-operative specialization, in which all great achievements are accomplished, and will continue to be, by that type of co-operation in which each man performs the function for which he is best suited, preserving fully his own individuality, and losing none of his originality and proper personal initiative. At the same time, however, he must be controlled by and must work harmoniously with his fellow men.



Getting a French Avion-de-chasse ready for its experimental flights. (French Official Photo.)

The Application of Organized Design

The application of scientific principles is naturally just as important in aeroplane manufacture as in any other branch of industry. It has its own special difficulties, but that is all the more reason that steps should be taken to effectively combat them. One of the strongest arguments brought forward against the adoption of a well developed jigging system for aeroplane construction, is that in the present stage of the art, developments are so rapid and so many modifications have to be introduced in the machines that it is impossible to evolve a reasonable system of manufacture. The reply to this is, of course, that the design details of the jigging system must be so elastic as to permit of the introduction of modifications without delaying the progress of work. This only means that all the greater forethought and intelligence must be exercised, and further emphasizes the fact that aeroplane designs must be prepared by practical specialists. From the foregoing remarks it will be gathered that aeroplane jig designs cannot always be as simple as might be desired, since the jigs must be so constructed as to be readily and quickly altered, with a minimum expenditure of time and material, to conform to any required modifications. After all, the general run of modification only affects minor details as a rule, hence the modification bugbear is not so serious a matter as it might appear to be at first encounter, especially as only too many alterations are merely made to facilitate manufacture.

The existence of a jig and fixture drawing office would constitute a most valuable check upon the drawings, and would prevent many of the mistakes which have gone through to the shops in the past. This, in itself, would almost be worth the small extra staff and expense.

It has been estimated that during the life of many aeroplanes something like 400 modifications have to be incorporated, most of which are to correct drawing office errors and to overcome manufacturing troubles. A very considerable portion of these would be eliminated, if jigs and fixtures were designed concurrently with the working drawings of the machines. As regards the elimination of manufacturing difficulties it might be mentioned that one particular aeroplane could be manufactured in one-third the time it now takes, if only the mechanical details were more united to manufacturnig processes.

The obvious moral of the foregoing is that jigs and fixtures should be designed by a drawing office fully conversant with the whole design of the machine, including engine fittings and the fitting of the various instruments. To post all the shops and sub-contractors with this mass of information would obviously take a tremendous lot of time. Therefore it is clear that all the jigs for a machine should be designed by one drawing office and drawings and instructions distributed to the various shops and sub-contractors.

This centralizing of jig design has the great advantage, besides time saved in actual design, that all manufacturers will be posted as to the best way to make machines, having due regard to speed of production and soundness of job.

Another strong reason for a jig designing department is that the smaller aeroplane manufacturers, as a whole, are not mechanical engineers, and have had no experience upon which to fall back in designing jigs. In fact, many of them fail to appreciate that any speeding up of output could be attained by the extended use of jigs. This is due to the fact that in their experience, previous work of a different nature, they did not feel the need of such aids, as their work was more varied.

Classification of Jigs and Fixtures

It has already been mentioned that at least 1,200 jigs and fixtures are necessary for the manufacture of a modern aeroplane. In fact (including jigs for metal fittings) one maker employs 5,000 to great advantage. Hence, it will be of interest to consider the classification of a modern equipment.

1. Parts Jigs

(*a*) *Mill Jigs.*—For sawing, spindling, etc., parts to their exact size.

(*b*) *Drilling Jigs.*—For drilling all the holes called for on the fittings, the necessary bolt holes and the entering holes for large wood screws.

(*c*) *Parts Jigs.*—For completing the small built up parts, ready for attachment to components.

2. Component Jigs

(*a*) *Building Jigs.*—For assembling the various parts into a component (such as ribs, ammunition carriers, etc.)

(*b*) *Taping and Varnishing Jigs.*—For assisting in the quick winding of tape where necessary and for presenting the component in the best possible way for doping and varnishing. These jigs usually take the form of two center points on which the work rotates.

3. Unit Jigs and Fixtures

(*a*) *Unit Assembly Jigs.*—For assembling parts and components into a unit (such as wings, fuselages, ailerons, tail planes, etc.). These should locate the exact position for each part; and the parts, if made correctly, need not be touched by hand, the only work necessary being the insertion of necessary bolts, screws, etc., and wiring.

Girls operating machines used to automatically attach rib reinforcements.
(© Committee on Public Information)

(*b*) *Unit Fixtures.*—Take the form of benches specially made for a certain process, such as covering with fabric, doping, etc., designed to facilitate rapid handling of the unit in construction.

4. Erection Fixtures

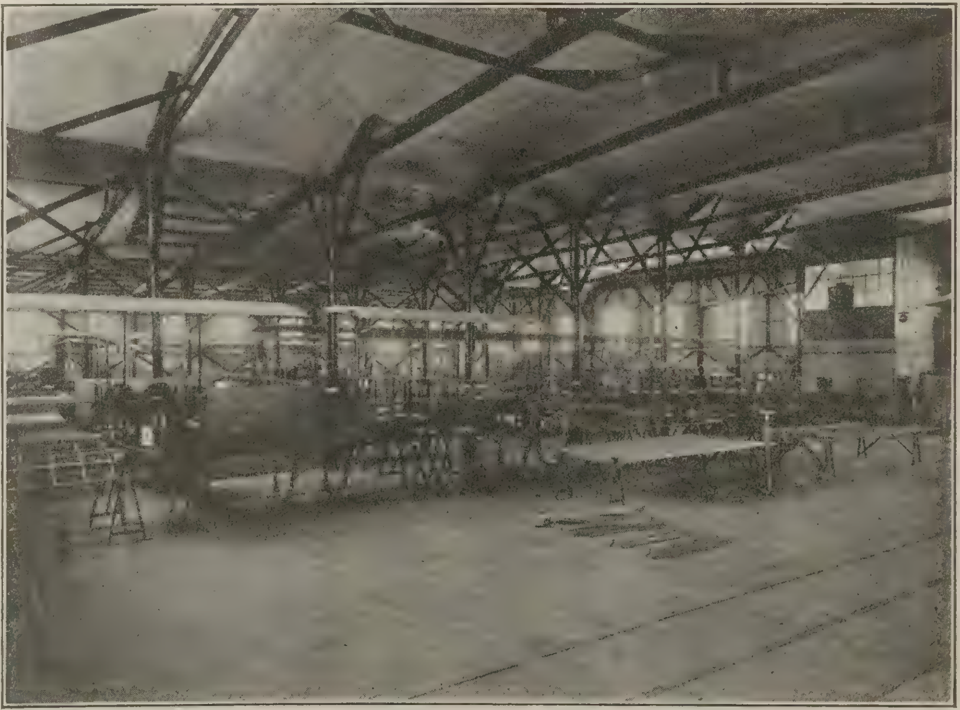
Are constructed to facilitate assembly of the units to the complete machine. A cradle should take the fuselage in its correct position, giving access for affixing the under carriage, the tail skid, and the planes. A supplementary fixture gives the exact position of the wings at the tips and fuselage, and obviates the difficulty of correctly pitching the dihedral, using plumb lines, etc. A tension gauge or tautometer should be used to determine the tautness of wiring, and by careful application a much better rigging will be ensured than is secured by the old method of straining until the correct alignment is secured.

The Principles of Design of Jigs and Fixtures

The general principle that must be followed out in laying out a jig or fixture is to decide upon the locating points of the outline of the clamping or holding arrangements. It should be borne in mind that these latter devices must be as quick acting as possible, and for rough work (*i.e.,* the early operations) some of the locating points will have to be made adjustable. Each jig should be so arranged that the work can only be inserted in the correct way. The ideal method of arranging the clamping and fixing devices is by placing them in the best position to resist the pressure of the cutting tools, that is, all clamps and fixing devices should be integral parts. At the same time complication must be avoided, as one of the objects of a good jig is to eliminate highly skilled labor. Effective support must be provided opposite to surfaces that contain guide bushings. If possible the jig should be so designed that all the locating points are visible to the operator when placing the work in position. Suitable clearance must be provided for the escape of cuttings and chips. Auxiliary devices that facilitate the manipulation of the jig, such as handles, should be provided whenever they assist in shortening the time required.

Many works claim to have very good jig equipments. Unfortunately, however, when the matter is probed into by anyone who really knows the full application of this method of manufacture, the reverse is only too often found to be the case. The usual much-lauded jig equipment generally only comprises a comparatively small number (*i.e.,* in regard to the 1,200 or so previously mentioned as necessary) of so-called board jigs. These consist of flat boards fitted with positioning stops and cam clamps. There is perhaps no more simple and useful all round type of jig than this, and it is very widely used in many most ingenious modifications. Unfortunately, however, it is often incorrectly emloyed, being used as a gauging jig rather than an assembling device. That is to say, a carpenter's bench is placed alongside, and strips of ready planed wood are tried out to length and fitted in place

(*Continued on page* 418)



Jigged up for final alignment before the factory test flights. (French Official Photo.)

The AIRCRAFT TRADE REVIEW

N. E. J.

To Increase Output

The Editor of Aerial Age happens to know at the present moment of several really useful engineers who are on the look-out for responsible positions. One is an exceedingly able motor mechanic, good at handling men, and with considerable experience in aeroplane erection and general handling. Another is a factory organizer with several years' experience. He has had a good technical training, but prefers commercial organization. Any firms who are on the look-out for good men are recommended to write to the Editor on this subject.

Benjamin Williams with Standard

Benjamin L. Williams has resigned as assistant secretary of the Manufacturers' Aircraft Association to accept the position of secretary to the president of the Standard Aircraft Corporation.

Mr. Williams was born at Newton, Sussex Co., N. J., on May 11th, 1880. His start in the business world began in 1892, and his engineering career with the West Orange Water Co. at West Orange, N. J., in 1897, as clerk, being later advanced to assistant superintendent, and in 1904 as superintendent. He qualified for this position by studying the technical side of his work while engaged in the actual construction.

He remained in that position until 1907. In that year he was appointed assistant general superintendent of the Edison companies, Orange, N. J., later became their construction engineer, and was finally made plant engineer. In 1913, Mr. Williams devoted his energies to building management in New York City until the early part of 1917 when the Aircraft Manufacturers' Association was organized and he was made its secretary.

In these several positions, Mr. Williams was an active element in the successful solution of the many problems encountered in the operating of public utility, industrial and isolated building plants, the conditions of which were generally most unfavorable. He is ranked as an expert on industrial plant equipment, maintenance, construction, experimental work and process routing, and has had an excellent experience on water supply and distribution, fire protection, sanitary work, building trades and property valuation. He has made numerous reports on manufacturing and engineering subjects and on matters relating to tax appeals on industrial plants and qualified as an expert on valuation of public utilities in the State of New Jersey.

Mr. Williams' activity in these various classes of engineering work has developed a fund of general business experience that was utilized to excellent advantage by the aircraft manufacturers, and the Standard Aircraft Corp. should find in him a valuable help in co-ordinating its extensive and expanding enterprise.

Fahrig Metal Co.'s New Plant

The Fahrig Metal Co., maker of Fahrig anti-friction metal, which is used for bearings of truck, aeroplane and other high-grade gasoline engines, has opened another plant which will double the production of Fahrig metal, at 34 Commerce Street, New York.

Government Wants Men for Export-Trade Offices

The Government is looking for men capable of taking charge of branch offices of the Bureau of Foreign and Domestic Commerce, Department of Commerce; also men to act as assistants in such offices. These branch offices are located in the principal commercial cities, the salaries ranging from $1,800 to $3,000 for managers, and from $1,200 to $1,800 for assistants.

Applicants should write at once to the Bureau of Foreign and Domestic Commerce, at Washington, as a non-competitive examination will be held on May 16th in various parts of the country. Full details will be furnished upon written application to the Bureau.

Applicants will be examined in export-trade technique, promotion of commerce, and economic geography, and credit will be given for knowledge of foreign languages. The examination will be given under the direction of the Civil Service Commission, but communications should be addressed to the Bureau of Foreign and Domestic Commerce.

The Tractor

The employees of the Standard Aircraft Corporation have published the initial numbers of their house publication, entitled "The Tractor," and from the copies we have received it would seem that the booklet will be a real force in coordinating the social activities and welfare work of this company. It is published monthly.

Acieral Company of America

Acieral Company of America, Office—26 Cortlandt Street, New York, N. Y.; Factory—20 Orange Street, Newark, N. J. Manufacturers of the Acieral metal in ingots, castings, sheets, rods and wires. This metal is an Aluminum composition with a tensile strength of 23,000 pounds per square inch in castings and 60/70,000 pounds in rods and sheets. This company manufactures also manganese bronze of high grade, and is working on large contracts for the Navy on torpedo tubes. Has still capacity for Acieral castings and also rods and sheets. All communications should be addressed to Mr. Alberto de Lavandeyra, secretary of the Acieral Company of America, 26 Cortlandt Street, New York City.

A Simple Process for Refining White Metal Drosses

A new invention that will prove of interest to users of white metals in the Cornwall Process and Dross Converter, for the refining of Tin, Solder, Babbitt, Lead and Type Metal Drosses.

With this process it is possible for manufacturers, large and small, to refine and recover from their metal dross practically all of the metallic contents. What this will mean in economy may be realized by looking over the market quotations of these metals. The cost of operation is claimed by the manufacturers to be less than one-half cent per pound, and the operation is so simple that one man can do all the work. The small space required for its installation is a feature, as twelve feet square is ample.

In these days of scarcity of Tin, the process will enable manufacturers to conserve their supply of pure metal, besides retaining for themselves the profit hitherto made by the refiner in treating the drosses.

The Cornwall Process and Dross Converter is manufactured by Mason, Davis & Co., of Grand Crossing, Chicago, who are also large manufacturers of scales and light grey iron castings.

Woodworking Facilities

The Wangerin-Weickhardt Co., 112-124 Burell St. and 117-121 Austin St., Milwaukee, Wis., a corporation with a working capital of $65,000 and 30,000 feet of floor space, has announced its intention to undertake the manufacture of wood parts for aeroplanes. This firm has a large plant in Milwaukee, Wisconsin, for the building of pipe organs, but, finding a demand for its product greatly curtailed in consequence of the present war-time conditions, decided to utilize a portion of its high-class equipment for the execution of aeroplane woodwork. Considering the fact that no woodworking establishment requires such extremely accurate and precise workmanship as does the building of pipe organs in the construction and assembling of its countless parts, it will readily be understood that the skilled experts employed in that industry are exceptionally qualified for the production of wood parts required in aeroplanes. It may or may not be the program of the aircraft board to standardize the construction of aeroplanes and have them built on a gigantic scale, but any ordinary or extraordinary demand for wood parts to be used in their manufacture can abundantly and skilfully be supplied by some of the large organ building factories. If further particulars are desired address Adolph Wangerin, president of the Wangerin-Weickhardt Co.

General Aeroplane Co. Discontinues Business

Mr. Corwin Van Husan, formerly secretary and treasurer of the General Aeroplane Co., of Detroit, Michigan, has asked Aerial Age to announce that this company has discontinued business on account of his being in the service.

Ford Motor Expanding

Several new contracts have been awarded by the Ford Motor Company of Detroit, for the erection of factories intended for testing of aircraft motors.

Detection of Foreign Oils in Castor Oil Used for Lubricating Aeroplane Motors

The acetyl value is capable of indicating the presence of one to two per cent of foreign olis in castor oil, but the other constants are of little value for the purpose. In the special case of castor oil adulterated with arachis oil the solidification point and the solubility in alcohol are the most sensitive tests (limit, 5 per cent). For smaller amounts of arachis oil the turbidity temperature of the alcoholic solution may be determined. A solution of one volume of pure castor oil in 95 per cent alcohol remains clear when chilled below — 20 degrees C.; but in the presence of arachis oil the solution becomes turbid at temperatures ranging from + 5 degrees or + 6 degrees C. for 5 per cent to — 2 degrees or — 3 degrees C. for 2 per cent of arachis oil. An alcoholic solution of castor oil containing one per cent of arachis oil becomes opalescent at — 4 degrees to — 5 degrees C. and turbid at — 9 degrees C. Foreign oils may be separated from castor oil by shaking 20 c.c. of the sample

Executive heads of the Standard Aircraft Corporation at the testimonial dinner extended to their President, Mr. Harry Bowers Mingle

with 80 c.c. of petroleum spirit of b.pt. 35 degrees to 70 degrees C. in a stoppered graduated cylinder. After settling, the volume of the lower layer containing the castor oil will show an increase of about 11 to 12 c.c. if the oil is pure, or more if foreign oils are present. On evaporating 50 c.c. of the petroleum spirit layer a residue is left, which in the case of 12 samples of pure castor oil ranged from 8.35 to 8.70 per cent of the original oil. Mixtures containing from 30 to one per cent of arachis oil gave residues ranging from 38.61 to 10.04 per cent and by deducting from these the average value for pure castor oil (8.52 per cent), the results agreed closely with theory. The method also effects a concentration of the arachis oil, which facilitates the detection of arachidic acid by Bellier's method. For example, the petroleum spirit extract from castor oil containing 5 per cent of arachis oil will contain 36.7 per cent of that oil—Note in *Jour. Soc. Chem. Ind.* on an article by C. Frabot in *Ann. Chim Analyt.*

Italy Places Hope In Big Battle Planes

Italy is prepared for any exigency on the battlefield now, and if that nation could be supplied with an adequate number of aeroplanes of the Caproni type a decisive victory on the Austrian front would only be a question of a very few months, says Lieutenant Leopold Belloni of the Italian Aviation Corps, sent here as a member of a mission to stimulate the production of these machines.

"The war will be won in the air with aeroplanes," Lieutenant Belloni says. "We want a large number of machines that are capable of inflicting damage upon the enemy's closest assembled forces, supply depots, hangars and factories. We should be able to destroy the enemy's eyes.

"With that end in view we are constructing self-defending battle planes, machines which have several men in the crew, carry four to six machine guns, as well as 1,200 pounds of bombs. With these we hope to penetrate the enemy's line of aerial defence and destroy the nineteen factories that are now working day and night making aeroplanes for the Austrian forces.

"In this way we can surely win. For example, Lieutenant Richthofen, who was killed recently and who was officially credited by the German Government for the destruction of seventy-eight Allies' machines, had to work four years to accomplish the feat. With the machines that we hope to have an entire factory should be demolished in half a day."

Loving cup presented to Mr. Harry Bowers Mingle, president of the Standard Aircraft Corporation, by the employees and executive heads of the corporation

Personal Paragraphs

Harold N. Bliss, formerly production manager, engine department, Thomas-Morse Aircraft Corporation, is now superintendent, engine department.

Sidney W. Colvard, formerly inspection engineer, Curtiss Aeroplane & Motor Corporation, Buffalo, is now assistant general inspector and foreman, Factory E.

Noble Foss of the Sturtevant Aeroplane Co., Jamaica Plain, Mass., is now president and general manager.

George B. Fuller, formerly aeronautical mechanical engineer, Aviation Section, Signal Corps, Dayton, is now assistant chief engineer, Glenn L. Martin Co., Cleveland.

E. K. Hill, formerly in engine department, Thomas-Morse Aircraft Corporation, Ithaca, N.Y., is now in inspection department, Simplex Works. Wright-Martin Aircraft Corporation, New Brunswick, N. J.

Guy A. Little, formerly in dynamometer department, is assistant to chief inspection engineer, Curtiss Aeroplane & Motor Corporation, Buffalo, New York.

E. V. Schaal, formerly in inspection engineering department, is now heat-treatment inspector, Curtiss Aeroplane & Motor Corporation.

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The far west gives up its treasure. Lumbering aeroplane spruce in the State of Washington

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronau tics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1.—Report to Brig. Gen. A. L. Dade, Director, aviation training, for duty.

Note 2.—Report to district approval's office, Lindsey Building, Dayton, O.

Note 3.—Report to Capt. Edwin B. Lausier, finance department, 15 Park Row, New York, N. Y.

Note 4.—Report to Signal Corps recruit depot, Fort Wayne, Mich.

Note 5.—Report to aviation construction camp, San Antonio, Tex.

Note 6.—Report to director of Tank Corps for duty.

Note 7.—Proceed home and wire Adjutant General of Army on arrival.

Note 8.—Report to Signal Corps Aviation Mechanics' School, St. Paul, Minn., for duty.

Note 9.—Report to medical reserve board, Mineola, Long Island, N. Y.

Note 10.—Appointed president, aviation examining board, San Antonio, Tex., in addition to present duty.

Note 11.—Report to Capt. Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 12.—Report to Camp Alfred Vail, Little Silver, N. J.

Note 13.—Report to laboratory of Eastman Kodak Co., Rochester, N. Y.

Note 14.—Report to equipment division, laboratory, Seventh and Bedford Aves., Pittsburgh, Pa.

Note 15.—Report to Lieut. Col. Jesse C. Vincent, Dayton, O.

Note 16.—Report to Springfield Aircraft Corporation, Springfield, Mass.

Special Orders 86 to 92, Inclusive

A

Andrews, Harold F.	FRF
Andrews, Frank M.	RSD
Alvord, Lincoln.	DIK
Axley, Seth.	DIK
Aaron, Samuel A.	PFO
Appleman, Earl.	FRF
Ackerman, Edwin D.	CSO
Arnold, George M.	DIK
Austin, Harold R.	OSU
Armantrout, Guy E.	OSU
Adkisson, William T.	WAC
Adams, Chester Ashley.	SLR
Alvord, Lincoln.	SLR
Anderson, Clarence.	SLR

B

Bullock, Bryant W.	KST
Boulware, George L.	DIK
Brooks, J. Ansel.	CSO
Bernant, Lester C.	DIK
Bowman, Lawrence J.	RSD
Barcklow, John C.	FRF
Brookley, Wendell H.	DIK
Brooks, Roger E.	DIK
Brown, Clifford A.	DIK
Baum, Leland M.	DIK
Bassett, James W.	DIK
Barcklow, John C.	DIK
Bush, Bradford S.	DIK
Boatright, Bernard D.	DIK
Barnard, George A.	PFO
Bennett, Horace R.	PFO
Browning, Russell.	PFO
Benet, William E.	CSO
Bryant, Frank A.	CSO
Browerson, Leroy.	FRF
Barnhouse, Donald G.	HHN
Bramhall, Maynard.	FRF
Bailey, James R.	FRF
Blackard, Charles G.	FRF
Bracken, Joseph R.	FRF
Buckley, Francis J.	FRF
Buckmaster, Samuel A.	FRF
Bower, David H.	CJW
Brown, Herman M.	SLR; OSU; FRF
Brown, William L.	SGS
Brown, Robert H.	WAC
Butler, Frederick W.	DIK
Birmingham, Hugh J.	OSU
Baldwin, Marion A.	OSU
Burleigh, Donald M.	OSU
Ballard, Audrey B.	FRF
Blum, Clarence A.	FRF; DIK
Baer, Milton D.	FRF; SLR
Bebb, Edwin A.	FRF
Brissel, Willard S.	FRF
Boddie, John B.	SGS
Bateman, George L.	FRF
Brockmeyer, Albert F.	DIK
Barrett, James R.	FRF
Baildon, John K.	SLR
Bailey, Louis C.	SLR
Bateman, George L.	SLR
Baum, Leland Mason.	SLR
Bebb, Edwin A.	SLR
Bloodwort, Thomas Stokeley Morgan.	SLR
Boardman, Vinson R.	SLR
Boatright, Bernard D.	SLR
Bradford, Thomas Leonard, Jr.	SLR
Brissel, Willard S.	SLR
Brodrick, William J.	SLR
Brookley, Wendell H.	SLR
Brooks, Roger Eaton.	SLR
Brownlee, Fred Parke.	SLR
Byington, March Maeck.	SLR
Bentley, Madison.	Note 9
Berkowitz, Walter J.	Note 16

C

Cannon, Thomas O.	FRF
Clark, Smith D.	FRF; DIK
Carlson, Hilding N.	CSO

Carmine, John W. S.	DIK
Carroll, Alfred B.	DIK
Craig, John W.	DIK
Crandall, Norris I.	DIK
Conway, John S., Jr.	DIK
Chase, Paul W.	DIK
Cummings, Frank J.	DIK
Calef, Robert C.	PFO
Cole, Charles C.	PFO
Cooney, Joseph J.	FRF
Cameron, Don R.	FRF
Coleman, John M.	KST
Cook, Philip P.	UIU
Cimmino, Frank	OSU
Carpenter, Martin F.	SGS
Crary, Allan H.	SGS
Craigie, Karl H.	FRF
Cole, Albert B.	FRF
Callender, Marshall C.	FRF
Caraway, Talmadge E.	FRF
Campion, John L.	FRF
Channing, John	FRF
Clark, Holland R.	SGS
Carrier, Alfred C.	FRF
Campbell, Thomas P.	DIK
Cone, Edmund L.	FRF
Cornell, Donald S.	FRF
Coesfeld, Henry M.	OSU
Colby, Oliver M.	FRF
Cabell, Philip Frank	SLR
Callender, Alfred R.	SLR
Campbell, Alexander	SLR
Carmine, John W. S.	SLR
Carroll, Alfred B.	SLR
Cavargnaro, James F.	SLR
Crafts, John Andrew	SLR
Crandall, Norris I.	SLR
Craigie, Karl H.	SLR
Conway, John S., Jr.	SLR

D

Donnelly, Walter J.	DIS
Denney, Archibald M.	FRF
Dudley, Albertus T.	DIS
Davis, Kenneth M.	FRF; DIK
Duryea, Leslie N.	FRF; DIK
Deacon, Ralph A.	OSU
Doyle, John C.	DIK
Dodds, Hiram E.	DIK
Davis, Donald Derby	CSO
Davidson, Edward C.	PFO
De Courcy, William E.	PFO
Donalds, John E.	PFO
Dorland, Chester P.	CWT
Donovan, Joseph D.	KST
Drennan, Leonard H.	RSD
Daley, Eugene F.	OSU
Davey, John A.	DIK
Dimmick, Harold E.	FRF
De Nio, Earl William	WAC
Dillon, Oscar L., Jr.	WAC
Day, Richard F.	FRF
Drescher, Herbert C.	FRF
Dunn, Walter V.	FRF
Dunton, Gardner	FRF
De Golyer, Donald Lee	SGS
Duke, Donald G.	FRF
Darling, Harold P.	FRF
Dolan, Harry A.	FRF
Daley, Walter F.	FRF; DIK
Donbo, George W.	DIK
Davis, Earl A.	DIK
Dallas, Burnie R.	SLR
Davidson, Edward Crawford	SLR
deBettencourt, Manuel A.	SLR
Denton, Winfield Kirkpatrick	SLR
Dickson, David C.	SLR
Dorrance, George Wright	SLR
Dowman, Charles H.	SLR
Dudley, Albertus T.	REL; Note 7
Dilworth, Joseph	Note 4

E

Eagle. Audrey L.	VBW
Ebert, Solomon B.	FRF
Edgerly, John P.	MAJ
Enright, John E.	CSO
Elliot, John S.	AGC
Enright, Walter J.	ELA
Eichelberger, Raymond T.	FRF; DIK
Easters, Edmund	WAC
Ellison, Frederick J.	SLR; FRF
Eccleson, Henry V.	FRF
Edwards, Duncan L.	FRF
Ellsworth, Frank Van P.	SGS
Everall, James R.	SAG
Emerson, Sigard A.	SLR

F

Field, William B. O.	CSO
Furrow, George C.	SAG
Farmer, Alfred G.	WFO
Flook, Harry E.	DIK
Friedman, Max H.	DIK
Fitzgerald, Joseph J.	FRF
Fitzgerald Gordon P.	FRF
Fletcher, Robert H., Jr.	CAF
Fonseca, Francis M.	PFO
Fischer, Ernest A.	HHN
Faurot, Henry, Jr.	FRF
Frank, Milton L.	AGC
Ford, Edward B.	FRF
Fouts, Kenneth C.	SGS
Fisher, Albert L.	FRF
Frost, Ezra R., Jr.	FRF
Freeze, Jackson L.	FRF
Fairclough, Richard H.	FRF
Folson, Harold James	SLR
Fowler, Lee T.	Note 5
Foster, Henry J.	Note 11
Foster, Robert M.	Note 4

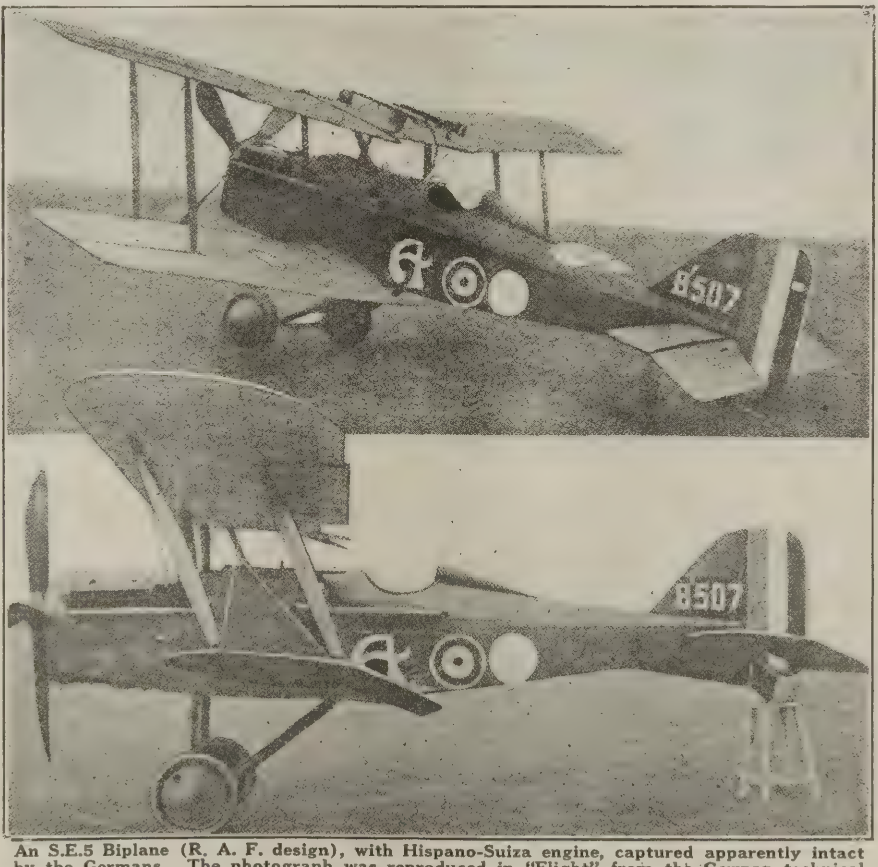
Lieut. Grace, in charge of the Medical Corps attached to the Ecole d'Aviation for American aviators "somewhere in France"

G

Garrison, Russell P.	FRF; DIK
Girard, Alfred O.	CSO
Gleason, Howard H.	DIK
Galbraith, James S.	DIK
Geisendorf, Louis C.	PFO
Griffin, Thomas S. P.	REV
Greenslade, Russell M.	FRF
Greene, William	TFT
Giles, Barney McKinley	FRF; DIK
Grubb, Kenneth P.	FRF; DIK
Graf, Louis E.	FRF
Garnett, Joseph H.	FRF
Gorman, Aiden J.	OSU
Galinger, George W.	DIK
Gillern, Maurice F.	OSU
Galbraith, James S.	SLR
Garratt, Harold Caleb	SLR
George, Rowland Herbert	SLR
Giddings, Lee C.	SLR
Gleason, Howard H.	SLR
Goslin, Arthur	Note 8
Gell, Henry	Note 2

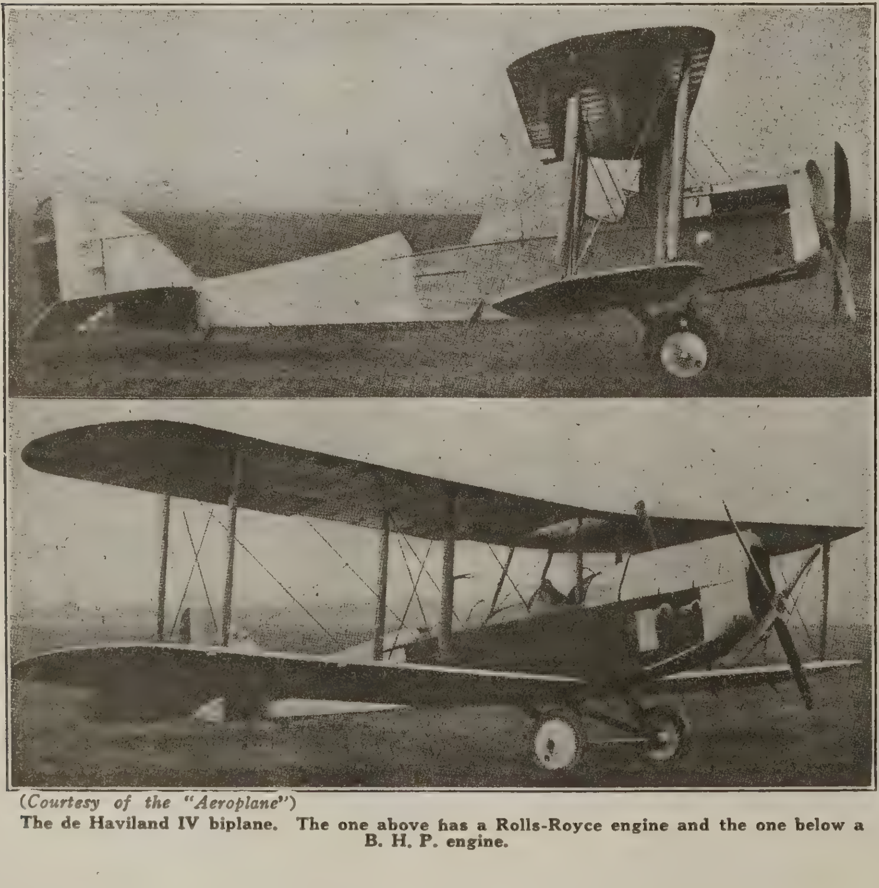
H

Heard, Jack W.	PWM
Hawks, Harold P.	EOT
Huking, Harry W.	FRF
Haslett, Elmer R.	FLR
Hobley, Alfred H.	WFO
Hinckley, Nelson C.	DIK
Henricks, Harold H.	DIK
Henriques, Charles R.	DIK
Hoyt, Ross G.	FOB
Holmes, Beverly W.	FRF
Harris, David B.	FRF
Hastings, Charles E.	FRF
Healey, Claude S.	FRF
Holmes, Robert B.	FRF
Hughes, Joseph V.	FRF
Herine, Merrill C.	CAF
Huntley, James W.	REV
Hegenberger, Albert F.	FRF; DIK
Holland, John F., Jr.	FRF; DIK
Hubbel, Edward S.	FRF; DIK
Harrison, George B.	FRF
Heck, George L., Jr.	FRF; DIK
Hodges, Alvin R.	FRF; DIK
Houston, Horace K.	FRF; DIK
Harrison, Travis L.	FRF
Hill, Maurice S.	FRF
Hooper, Edwin M.	OSU
Harding, Paul C.	OSU
Hind, Harry L.	SGS
Hough, Roscoe R.	FRF
Howley, William T.	FRF
Holmes, Beverly W.	OSU
Hiestand, Benjamin	FRF
Horner, Harold R.	FRF
Hooks, Arthur J.	FRF
Hammond, Fred Robinson	SLR
Harris, David B.	SLR
Hastings, Charles E., Jr.	SLR
Healey, Claude S.	SLR
Henderson, William Abbott	SLR
Henriques, Charles Ransom	SLR
Hill, Roland Everett	SLR
Hollopeter, Orville C.	SLR
Holmes, Robert B.	SLR



An S.E.5 Biplane (R. A. F. design), with Hispano-Suiza engine, captured apparently intact by the Germans. The photograph was reproduced in "Flight" from the German technical journal "Flugsport"

Secretary of War Baker and his official party at one of the American aviation camps in France. The upper illustration shows three French Nieuport training machines in the air and more on the ground. The lower picture shows the Secretary with General Pershing and his staff officers



(Courtesy of the "Aeroplane")
The de Haviland IV biplane. The one above has a Rolls-Royce engine and the one below a B. H. P. engine.

Howley, William Timothy	SLR
Hughes, Joseph V.	SLR
Heron, Percy H.	Note 4
Hyman, Kenneth R.	Note 10
Hood, Albert D.	Note 4
Huntley, James W.	MSC
Harper, William J.	Note 4

I

Immig, August C.	FRF; SLR
Ives, Joseph Francis	SLR

J

Jackson, Oliver P.	DIK
Johnson, Rollin G.	FRF
Johnston, Donald	FRF
Jiskra, Joseph B.	MSC
Jones, Charles C.	UIU
Jacob, Walter P.	HHN
Johnson, Bruce	SLR; FRF
Jones, Lee B.	OSU
Jones, James S.	FRF; DIK
Jackson, Percival E.	SLR
Jensen, Jorgan Edward	SLR
Johnson, Frank A., Jr.	SLR

K

Kiefer, William R.	WFO
Kerr, Chichester C.	WFO
Kane, Henry F.	HHN
Kuchins, Harry Leonard	SLR; KST
Kaedine, George L.	DIS
Keller, Clarence K.	DIK
Killough, Hugh B.	FRF; CDT
Filburn, George W.	FRF; DIK
Knoche, Frederick E.	FRF; DIK
Keogh, Martin J., Jr.	AGC
Koster, Harold B.	FRF
Kelsh, Harry T., Jr.	SAG
Keeley, James H., Jr.	FRF
Kiely, Michael A.	SAG
Keffer, Karl, Jr.	FRF
Kavanaugh, Claude	PFO
Kirkpatrick, Stewart R.	OSU
Keller, Clarence K.	SLR
Kerr, Frederick Milbank	SLR
Kiler, John Quincy, Jr.	SLR
King, Ned E.	SLR
Kirkland, Samuel Noyes	SLR
Knowles, John Aubrey	SLR
Koiner, Carl W.	SLR
Krause, James W.	Note 13
King, Ira C.	Note 4

L

Lungren, Fridolph	HHN
Longanecker, Ira	GLC
Longstreet, Jack Y.	SLR; DIK
Lewis, Hobart H.	DIK
Luscher, Carter	FRF
Lanahan, William W.	SMM
Lassiter, Glenn Robert	OSU
Lloyd, Lawrence A.	FRF
Lovell, McDonald	OSU
Lundberg, George G.	OSU
Lavene, Clayton C.	FRF
Luder, Leslie J.	FRF
Lyle, Samuel P.	FRF
Lewis, Hobart H.	DIK
Leger, John C.	FRF
Ledbetter, Eugene P.	FRF
Law, Hugo B.	PFO
Lachmund, Harry G.	SLR
Langstroth, Marshall	SLR
Larkin, George B.	SLR
Lavelle, Michael J.	SLR
Leazer, Augustus	SLR
Leger, John C.	SLR
Leininger, William Henry	SLR
Lewis, Richard Phelps	SLR
Lindsay, Gordon J.	SLR
Logel, Joseph F.	SLR
Lowery, Willis D.	SLR
Lovelace, Lake	SLR
Lee, George F.	Note 1
Littlejohn, Harry F.	Note 3

M

McAleenan, Alvin	FRF
Mason, James M.	KST
McCalley, James B.	WFO
Mars, James A.	WFO
Mabry, Palmer V.	KST
McLaughlin, John J.	REV
Moore, Marlin C.	DIK
Martin, Charles A.	FRF
Matthews, Robert H.	FRF
Maurice, Benjamin Van Dyke	FRF
Miller, Wesley A.	FRF
Moon, Lawrence B.	FRF
Moye, Frank L.	FRF
Moran, William J., Jr.	FRF; CDT
Mulenber, Henry C. K.	TFT
McCrossen, James F.	FRF
McLaughlin, John J.	FRF
Mapes, Donald D.	FRF
Miller, Ivan C.	FRF
Morrow, Wade H.	FRF
Meeks, Charles C.	FRF
Michels, Joseph S.	FRF
Morgan, Stuart A.	FRF
Means, James F.	FRF

McDougall, Kenneth	FRF
Meldahl, Carl J	FRF
Meraux, Jules C	FRF
Meyer, Philip	OSU
Morrison, John M	PWM
McDaniel, Harry H	TMA
Mackall, Porter A	AGC
Mills, Harold W	OSU
Mahler, Herbert P	FRF
Minges, Henry V	FRF
McMinn, Wiley W	FRF
McEwen, Robert R	PFO
McLaughlin, John G	SLR; FRF
Maloney, John P	FRF
Mengel, Herman	FRF
Munson, Clinton G	FRF
McBride, Walter J	SLR
McKenzie, Wesley Raymond	SLR
Marshall, Richard Horatio	SLR
Matthews, Robert Harry	SLR
Maxwell, William C	SLR
Miller, Julian F	SLR
Miller, Wesley Albert	SLR
Monteith, Darrel McD	SLR
Moon, Lawrence Bartelle	SLR
Moore, Marlin C	SLR
Morris, John P	SLR; FRF
Moser, Harry V	SLR
Muller, Auguste F	SLR; FRF
Matthews, John H	Note 12
McCoy, Peter J	REV; Note 3
Mayfield, Mercer B., Jr	WCS; Note 14

N

Norton, Howard B	DIK
Nolan, Charles L	DIK
Nourse, Charles J	WFO
Nelson, Theodore E	OSU
Niblack, Polk H	SLR
Nolan, Charles L. V	SLR
Nichols, Joseph F	Note 4

O

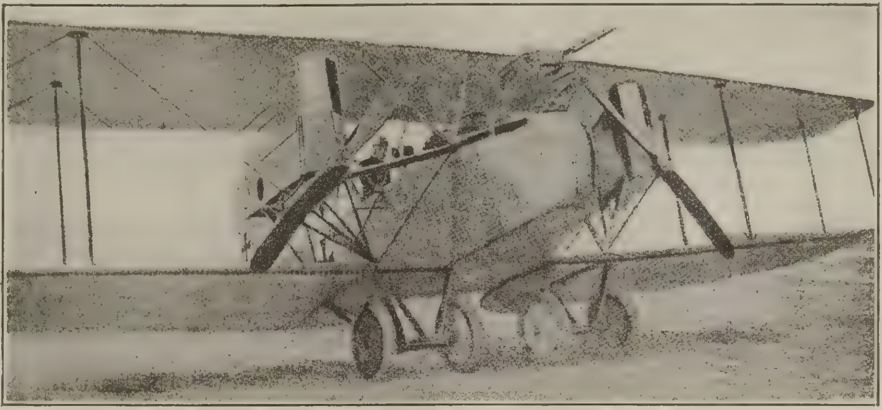
O'Brien, Martin J	SLR; DIK
O'Kennedy, Dennis M	DIS
O'Leary, Arthur C	FRF
O'Neil, Charles O	FRF
O'Neill, Ralph A	SLR
O'Neil, James J	PFO
O'Brien, Maurice F	PFO
O'Brien, John J	CSO
O'Connell, Robert E	SLR
Oaks, John C	OSU
Ott, Ralph T	OSU
Oakley, Edward H	CWT
Osborn, George M	SGS
Ohrstrom, George L	PFO
Ogilbee, Charles A	OSU
Olmstead, Charles H	Note 4

P

Peters, Sidney V. W	DIK
Price, Albert A	FRF
Payne, Glenn Watson	SLR; CSO
Parks, Lee Decatur	SLR; KST
Parsons, Frederick C	DIK
Pyke, Charles L	DIK
Perkins, Leroy C	FRF
Parker, Ashton	WAC
Pendleton, Albert G	FRF
Pierson, Walter E	FRF
Philbrook, Philip E	OSU
Peterson, Tenny C	PFO
Parkhurst, Amos J	OSU
Pence, Ferris E	SLR; FRF
Pardee, Max A	SLR
Parks, Ralph O	SLR
Poulin, John A	DIK
Pitts, Younger Arnold	SLR
Price, Owen N	SLR
Pyke, Robert W	SLR
Pope, Ralph Linder	FLR; Note 15
Phillips, Donovan R	Note 4

R

Rowson, Walter	RSD
Reid, Walter H	CRI
Rogers, Frank W	DIK
Riddlesbarger, Rufus	FRF
Ryerson, Edward L	CSO
Ridley, Oscar T	PFO
Roberts, Roscoe O	PFO
Rath, Joseph M	PWM
Radcliffe, Harry E	WAC
Reasoner, Nathan R	OSU
Ridgely, Arthur O	OSU
Roberts, James P	OSU
Reber, James S	OSU
Rubel, James L	FRF
Ronalds, Reginald	SAG
Ranson, John William	SLR
Ratliffe, George Thomas	SLR
Reed, John Henry	SLR
Riddick, Rolland C	SLR
Riddlesbarger, Rufus	SLR
Roberts, Francis N	SLR
Roberts, George Lewis	SLR
Robertson, Charles Blackford, Jr	SLR
Rodenhurst, Edward Percy	SLR
Roe, James Aloysius, Jr	SLR
Rogers, Emery H	SLR
Rose, Joseph W	SLR
Ross, Harry S	SLR
Rogers, William E	REV; Note 3


The Siemens-Schuckert "Grossflugzeug," twin-engined bombing plane, a comparatively recent German machine, and predecessor of the much advertised "Riesenflugzeug"

S

Schlipf, Albert C	SLR
Schmocker, Fred C	SLR
Schroeder, John, Jr	SLR
Semple, John Clary	SLR
Sharer, Donald David	SLR
Shaul, Gilbert L., Jr	SLR
Shaver, John Bernard	SLR
Shull, David R	SLR
Sills, Archie Lee	SLR
Smith, Orval K	SLR
Smythe, Allen M	SLR
Squier, Carl B	SLR
Stanbery, Floyd Edgar	SLR
Stanton, Louis Gelard	SLR
Steele, Dudley M	SLR
Strawn, Paul Arnold	SLR
Stenstrom, Samuel Andrew	SLR
Sutton, Harry Leon	SLR
Swain, John Dimmitt	SLR
Swain, Roland Hill	SLR
Synnestvedt, Fred	SLR
Sileo, Cavio F	CGC
Shulein, Benjamin M	MMP
Stevens, Albert W	AGC
Santos, Alexander H	FRF
Shields, Emmert	PWM
Shaffer, Harvey W	FRF
Southard, Alfred M	FRF
Smith, Walter L. G	FRF
Stocking, Charles D	FRF
Sears, Paul B	DAF
Shattuck, Ray Attwood	OSU
Santos, Alexander H	DIK
Swanson, Ivar R	FRF
Stearns, Francis A	FRF
Smith, Arthur H	HHN
Sleete, Claude W	DIK
Swain, John D	DIK
Stolze, Charles W	RRV; WCS
Shankle, Clarence E	FRF
Sievering, Philip J	FRF
Smythe, Allen M	FRF
Stanberry, Floyd E	FRF
Sutton, Harry L	FRF
Smith, Lawrence K	CMV
Stembridge, Alfred R	CSO
Stock, Hugo L	FRF
Stapler, Walter S	FRF
Schlatter, Donald W	PFO
Slade, William	PFO
Smith, William H	Note 3
Searle, George L	Note 4
Stagg, Thomas E., Jr	Note 4
Stephens, Roderick	Note 6
Smith, George L	Note 4
Schaffer, William D	Note 4
Schaffer, George A	Note 4
Scarboro, William E	Note 4

T

Tate, George L	FRF; DIK
Thomas, Errold B	FRF
Thomas, Everett B	SLR
Thomas, William Ellis	SLR
Thompson, David E	FRF
Thompson, Harwell C	FRF
Thompson, Arthur F	SLR
Templeton, Raymond E	PFO
Toole, Theodore T	AGC
Tolbert, Benjamin H	FRF
Tocher, Bernard J	FRF
Trotter, Harold E	FRF
Tucker, Fred G	FRF
Towle, Gerald	OSU
Tillou, Harold J	CSO
Tabor, Paul	SLR; DIK
Taylor, Harold L	SLR
Towner, Bob George	SLR
Trotter, Harold E	SLR
Tucker, Fred G	SLR
Turner, Frank Gerald	SLR
Thaxton, Rufus G	Note 4

(*Continued on page* 414)

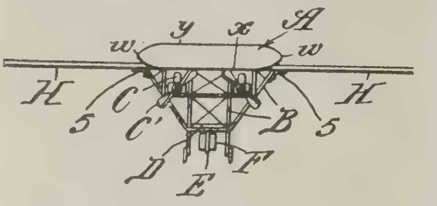
Aero Engineering Squadron at the U. S. School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,259,804. AERIAL MACHINE. Francis A. Thornton, Richmond Heights, Mo. Filed April 19, 1917. Serial No. 163,206. (Cl. 244—6.)

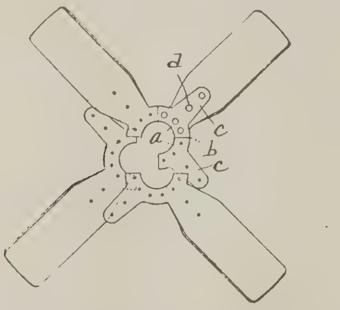
An aerial machine provided with an aerostat of rigid, or substantially rigid, construction whose depth is considerably less than its breadth, a structure of skeleton form depending from said aerostat, motors mounted on said structure adjacent the opposite ends of the aerostat and equipped with propellers, a car for the occupants carried by said structure, and a keel on said structure provided with a shiftable controlling member.



An aerial machine provided with an elongated aerostat having flat under and upper surfaces and ends that are tapered slightly on curved lines, and detachable aeroplane wings projecting laterally in opposite directions from the sides of said aerostat.

1,260,562. FAN CONSTRUCTION. James A. McIntosh, Detroit, Mich., assignor of one-half to John G. Heal, Detroit, Mich. Filed April 7, 1917. Serial No. 160,357. (Cl. 170—173.)

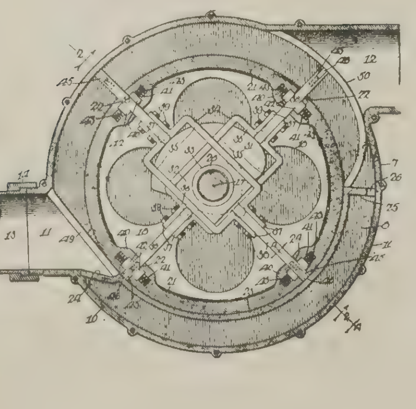
A fan made up of a plurality of blades having continuations in the form of L-shaped half rings and tongues, and means for securing these half rings, tongues and blades in overlapped relation to form a complete fan.



A fan comprising a plurality of blades, each blade having an integral continuation in the form of a segment provided with a projecting tongue, the said projecting tongue adapted to reach to the succeeding blade to which it is secured.

1,259,749. ROTARY ENGINE. Peter Jorgenson, Chicago, Ill. Filed June 6, 1917. Serial No. 173,219. (Cl. 121—75.)

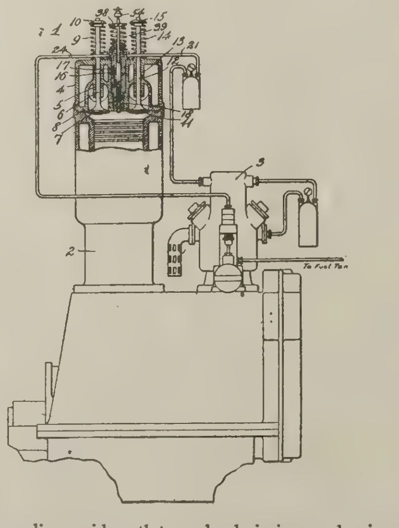
In a rotary engine, the combination with a suitably mounted cylinder having communication with a supply of motive fluid and an exhaust outlet, of a shaft rotatably journaled in the cylinder, a sleeve surrounding said shaft and extended into the cylinder and fixed thereto, a rotor fixed to said shaft and extended therefrom within the cylinder and having a radially slotted peripheral flange, a cam fixed on said sleeve, a collar angular in cross-section and mounted on said sleeve, one or more elongated guide yokes embracingly engaging said collar, rollers on the opposite ends of said yoke or yokes and in contact with the cam, and a wing-piston projected from each end of said yoke or yokes and extended through the radial slots of the flange of the rotor.



In a rotary engine, the combination with a suitably mounted cylinder having communication with a supply of motive fluid and an inlet and exhaust outlet, of a shaft rotatably journaled in the cylinder, a sleeve surrounding said shaft and extended into the cylinder and fixed thereto, a rotor fixed to said shaft and extended therefrom within the cylinder and having a radially slotted peripheral flange located concentrically with respect to the peripheral wall of the cylinder and at a distance thereform, said flange having a recess on each side of each of the slots therein, spring pressed packing-strips located in said recesses, a cam fixed on the aforesaid sleeve, a collar angular in cross-section and mounted on said sleeve, a pair of elongated guide yokes embracingly engaging said collar on each side of the cam and located at right-angles to one another, rollers carried by the opposite ends of each pair of said yokes and in contact with the cam, a wing-piston projected from the outer end of each pair of said yokes and extended through the radial slots of the flange of the rotor and between the spring pressed packing-strips carried thereby, spring actuated packing-strips located in the outer portion of each of said pistons, a segmental partition interposed between the heads of the cylinder and extended from near the inlet opening thereof, to a point near the exhaust opening of the cylinder, and in contact with the flange of the rotor, packing retaining members located in the mouth of the inlet opening and packing retaining members located in the mouth of the exhaust opening and curved inwardly from said opening to the adjacent end of said partition.

1,260,500. MIXING AND ADMISSION VALVE STRUCTURE FOR INTERNAL-COMBUSTION MOTORS. Alexander Winton, Lakewood, Ohio, assignor to The Winton Gas Engine & Manufacturing Company, Cleveland, Ohio, a Corporation of Ohio. Filed June 25, 1914. Serial No. 847,271. (Cl. 123—131.)

A mixing and admission valve for internal combustion motors, comprising a casing having air and fuel inlets and an outlet, a valve seat surrounding said outlet, and admission and mixing valve mechanism arranged therein and comprising a valve stem, a valve mounted upon said stem and coöperating with said seat, and a plurality of rings spaced apart to form annular chambers, alternate rings having external and internal peripheral passages respectively for the gas between said chambers whereby it will pursue a circuitous route through the mechanism and be thoroughly mixed, the rings having the internal peripheral passages being provided with integral spacing lugs near their outer peripheral, and the rings having the external peripheral passages having integral spacing lugs near their inner periphery.

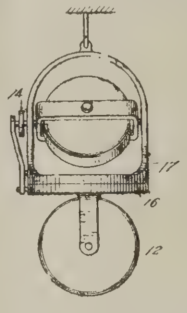


A mixing and admission valve structure for internal combustion motors, comprising a casing having a chamber provided with a valve seat, at its inner end, and a shoulder formed internally above the valve seat, together with a fuel port leading through the casing to a point in said chamber intermediate the shoulder and the outer end of the casing, and an air port leading to the outer end of said chamber, a plurality of spaced rings having openings forming circuitous passages for the mixture, said rings being arranged between said shoulder and fuel inlet opening, a valve coöperating with the valve seat, a stem for said valve extending through said rings and out through the outer end of the casing, a sleeve in said chamber surrounding said stem and engaging the rings and forming an annular peripheral passage for air from the air port to the rings, and clamping means engaging said sleeve for holding said sleeve and rings in place.

A mixing and admission valve structure for internal combustion motors comprising a cylindrical casing having a discharge valve seat at one end, an air inlet, a fuel inlet intermediate of the discharge valve seat and the air inlet, a valve stem extending through said casing, a discharge valve carried thereby and coöperating with said valve seat, a plurality of annular members forming communicating annular mixing pockets between the fuel inlet and the discharge valve, and a sleeve surrounding said stem and coöperating with the inner wall of the casing to restrict the flow of air from the air inlet to the fuel inlet.

1,260,097. GYROSCOPIC COMPASS. Junya Toyokawa, Tokyo, Japan. Original application filed December 21, 1914, Serial No. 878,290. Divided and this application filed May 17, 1917. Serial No. 169,169. (Cl. 74—78.)

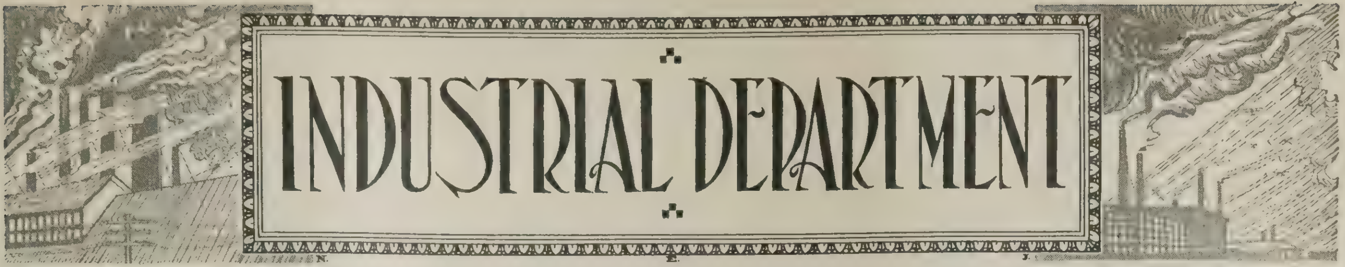
In a gyroscopic compass, gyro wheels respectively having two degree and three degree freedoms of movement, the axes of said wheels, when in equilibrium, always pointing, respectively, to the north-south and to the celestial pole and means to rock the support of one of said wheels relatively to the support of the other wheel.



In a gyroscopic compass, gyro-wheels respectively having two degree and three degree freedoms of movement, the axes of said wheels, when in equilibrium, always pointing, respectively, to the north-south and to the celestial pole, supports for said wheels, and a cam controlled connection between said supports for rocking one of said supports relatively to the other of said supports.

In a gyroscopic compass, gyro-wheels respectively having two degree and three degree freedoms of movement, the axes of said wheels, when in equilibrium, always pointing, respectively, to the north-south and to the celestial pole supports for said wheels, a cam carried by the axle of one of said wheels, and a connection between said cam and the support for the other of said wheels whereby said support is rocked coincidently with the axle of said first mentioned wheel.

In a gyroscopic compass, gyro wheels, respectively having two degree and three degree freedoms of movement, the axes of said wheels, when in equilibrium, always pointing respectively, to the north-south and to the celestial pole, supports for said wheels, a cam carried by the axle of the wheel, the axis of which points to the celestial pole, and means conencting said cam and the support for the wheel the axis of which points to the north-south poles, for rocking said support coincidently with the rotation of the axle of said first mentioned wheel.



INDUSTRIAL DEPARTMENT

GREATER ERIE

Third City of Diversified Interests in the United States

By EDWARD J. CROWELL, Acting Secretary, Erie Board of Commerce

ERIE, Pennsylvania, a city ranking third among the cities of the United States in diversity of its manufactures.

"Made in Erie" is a guarantee of quality, and the proud claim is made that Erie enterprises encircles the earth. From mouse traps, selling for one cent each, to monster electric locomotives, costing what to the majority of men would mean a great fortune, are made in Erie, and Erie manufacturers are always ready to fill orders, guaranteeing quality, service and satisfaction.

Erie is just midway between New York and Chicago and within easy reach of one-half the population of the United States. An Erie business man can enjoy his dinner with his family tonight and tomorrow morning be in New York, Chicago, Philadelphia or Washington as early as any resident of the cities named usually arrives at his office.

Iron ore arriving at immense docks on a superb land locked harbor meets coal and coke from the bituminous fields of Pennsylvania. Therefore, Erie predominates in the iron industry. With modern blast furnaces and up-to-date founders, it is claimed that iron castings are produced in Erie at prices which enable her iron masters to compete with any place on earth.

Always preferring peace with honor, rather than strife, yet when our President declared war, in order that the American ideals of peace, liberty and happiness shall be a perpetual assurance for mankind the world over, Erie's industries, designed for manufacturing articles covering the needs of men in times of peace, promptly became producers of materials for our fighting men, and now, from gas masks to great cannon, over fifty of her great manufacturing plants are turning out war materials in enormous quantities. The same spirit which dominated a hero of the nation and one of Erie's honored sons, alert to his duty when given the order, "Fire when you are ready, Gridley," prevails throughout the city, and great guns are being made that new heroes shall fire them. Already Erie's quota of enlisted men exceeds the number asked for.

When writing of Erie it is a temptation to make mention of its history, which is one of great interest and a record of proud achievement. However, not the *past*, but the *present* and the *future* is thought now in the minds of Erie's progressive citizens. Anyone visiting the city a few years ago and returning today wonders at the progress made and marvels as he hears the enthusiastic believer in the future tell of things done and greater ones which are bound to come to pass.

Phenomenal Growth Now and in Prospect

Throughout the entire city the sound of the pneumatic riveter is heard where great additions are being made to manufacturing plants—additions amounting to millions in cost.

One great company is spending over $2,000,000 for houses for its employes, another over $1,000,000, while yet another has recently purchased several hundred acres of land on which to erect homes. Furthermore, $750,000 is being spent by the United States Government for temporary dormitories for workmen employed in munition plants. Yet, that is not sufficient; so a housing company with a capital of $700,000, all of which was subscribed in ten days, is being organized. This housing company, working under the direct supervision of the United States Government, will begin at once the construction of over one thousand homes. It is promised that the United States Housing Commission will loan said company about $3,500,000 at 4% interest.

Homes built in Erie during the past five years if placed side by side would occupy both sides of twelve miles of city streets and, 840 of them accommodate from two to six families.

Between 12,000 and 15,000 mechanics are now being mustered in various centers and will be sent to Erie as rapidly as they can be accommodated with living quarters.

Erie is growing entirely away from the ideas of yesterday, and things are being done in a day that formerly took months. Even the men right in the thick of it are seeing more accomplished than their most optimistic dreams of a few years ago presented to them.

Erie is located on the south shore of Lake Erie, on Presque Isle Bay, a sheltered body of water which is 4½ miles long and 1½ miles wide, making the finest natural harbor on the chain of great lakes.

Transportation facilities are of the very best, the New York Central, Nickel Plate, Pennsylvania, Erie & Pittsburgh, and Bessemer & Lake Erie railroads passing through or having their termini at Erie.

Three interurban trolley lines connect Erie with all the important cities and territory east, west and south, affording freight as well as passenger service.

A municipally owned water works valued at about $4,000,000 furnishes an abundant supply or pure filtered water for domestic and factory uses at very moderate rates, and manufacturers have a never-failing supply.

The Erie Lighting Company and the Erie County Electric Company have monster power plants, which are supplying Erie industries with power at very low rates, and are sufficiently equipped to supply thousands of horsepower in addition to present demands.

Six large banks, the First National, Second National, Marine National, Erie Trust Company, Securitiy Savings & Trust Company, and the Peoples' Bank, with combined deposits of $26,152,697.44, furnishes ample capital for the needs and expansion of Erie's industries. Bank clearings for 1917 of the six banks were $92,463,103.85, an increase of $21,894,825.67 or 29.1% over 1916. A new bank, the Central Trust & Title Company, with a paid-in capital of $125,000, opened up for business recently. It already has deposits of $250,000, and the combined deposits of all the Erie banks is $26,668,609.94.

Erie is the largest fresh-water fishing port in the world, with an annual haul of from 12,000,000 to 20,000,000 pounds of fish, most of which is handled and shipped by large freezing and packing houses located on Presque Isle Bay.

Erie's location for commercial purposes is unsurpassed. Situated as it is, it is within easy reach of half the population of the United States. Its factories number 326, in 152 of which are employed at the present time 19,324 males and 2,499 females, and it is estimated that in all of the factories and mercantile establishments in the city there are employed 25,000 male and female persons.

The records of the Erie Custom House show that between 2,000 and 3,000 vessels enter and clear from the Erie port each year, and in 1918 there were brought into this port 2,030,484 tons of iron ore and shipped from it 1,312,706 tons of bituminous and anthracite coal, besides the large quantities of grain, lumber, pulp, wood and other merchandise handled.

Erie as a Residence City

Few cities of the United States can be called summer resorts as well as great manufacturing cities.

In speaking of Erie, one can truthfully say that Erie combines both of these wonderful advantages, and this is the reason why Erie is a most delightful place in which to live. The factory worker leaves his place of employment and in less than ten minutes' walk finds himself upon well-paved streets with wide sidewalks, well-kept lawns and beautiful shade trees.

Erie is a city of pretty homes with surroundings so well kept that its residence sections are virtually parks.

Recent careful estimates give Erie a population of 103,000, with 135 miles of streets,—75 miles of which are paved,—fine public buildings, twenty public and nine parochial schools, large public library, modern hotels, two fine hospitals, four theatres, fifteen moving picture houses, one conservatory of music, several large academies of learning, two business colleges, five newspapers, large fraternal homes, churches of every denomination, a $300,000 Y. M. C. A. building, four

(*Continued on page* 412)

FOREIGN NEWS

GREAT BRITAIN

The official statement dealing with aerial operations issued by the War Office on April 22nd says:

"After a long spell of stormy weather, which greatly hampered aerial work, the sky cleared on Sunday and our aeroplanes were able to remain in the air from dawn until dark. Bombing raids were carried out incessantly along the whole front. Over twenty-three tons of bombs were dropped on the Thorout railway station, Menin, Armentieres and various other targets.

"Thousands of rounds of machine gun ammunition were fired by our low-flying machines. Enemy machines were seen in large numbers, but were not aggressive. Eleven German machines were downed in air fighting and six driven down out of control. A hostile observation balloon was also destroyed. Anti-aircraft fire accounted for two other hostile aeroplanes. Five of our machines are missing.

"On Sunday night our night-flying machines again bombed Armentieres, Bapaume, the Chaulnes railway station and Peronne, dropping a total of nine and a half tons of bombs. All the machines returned safely."

"Our bombing machines were very active Monday," says the official statement issued on April 23, on aerial operations. "They dropped nineteen tons of bombs on numerous targets, including the Thorout Railway Station, the Engel ammunition dump and Warneton, Armentieres and Roulers.

"In the air fighting seven machines were brought down, six were driven down out of control or shot down in our lines by anti-aircraft fire and two hostile balloons were destroyed. Three of our machines are missing.

FRANCE

The French official communication of April 22nd reports the following aerial operations:

"On April 20th and 21st four German aeroplanes and two captive balloons were destroyed by our pilots, and a fifth was brought down by our infantry fire. Sixteen enemy machines fell inside their own lines badly damaged after aerial engagements.

"In the same period our bombing aeroplanes carried out numerous sorties. Forty-nine thousand kilos of projectiles were dropped on railway stations, cantonments and enemy aviation grounds in the region of St. Quentin, Jassy, Chaulnes, Roye, Ham, Guiscard and Asfeld. Two fires broke out in the Chaulnes station and the Asfeld station. A munitions depot east of Guiscard was exploded."

On April 25th, the following aerial activity was announced by the French War Office:

"On April 22nd and 23rd seven German aeroplanes and a captive balloon were brought down by our pilots. Ten other machines, badly damaged, fell inside their own lines. It is confirmed that two enemy aeroplanes reported as damaged April 20th were in reality brought down. Five other German machines and a captive balloon likewise were destroyed on April 21, 23 and 24.

"Five thousand kilograms of projectiles were dropped by our bombing 'planes on the railway stations at Nesle, Roye and Chaulnes. Our airoplanes have carried out numerous machine gun attacks on enemy concentrations."

"Allied aeroplanes detected vast, hurried concentrations of German troops yesterday," says an Associated Press dispatch dated April 24th, "enabling the Allies to prepare the stiffest resistance when the third German push was launched this morning."

According to the announcement of operations on the Balkan front, dated April 21st:

"An enemy machine was brought down by a British aviator northeast of Petritch."

During February, French naval aviation forces carried out more than 2,100 flights. Patrols and reconnaissances by airships amounted to about 200, and by captive balloons to 100. On several occasions mines were discovered or submarines successfully attacked.

A German aeroplane which was approaching Paris on the night of April 23rd was caught by the French searchlights, taken under a violent fire and compelled to land near Nogent l'Artaud. It was a bombarding triplane.

The crew, consisting of a lieutenant, a non-commissioned officer and a machine-gunner, was captured.

An official statement told of the attempted raid, as follows:

"Suspicious sounds of aeroplane engines having been reported by watching posts as coming in the direction of Paris, warning was given at 11:36 P. M. No aeroplane crossed the fire curtain or flew over the Paris district. All clear was sounded at 1:02 P. M."

GERMANY

"During the last two days thirty enemy aeroplanes were brought down," says the German official announcement of April 23d.

GREAT BRITAIN

The official statement relative to air operations issued by the War Office on April 24th reads:

"The weather on Tuesday was unfavorable for flying until 5 P. M., after which sharp fighting occurred in the air. Reconnaissances were carried out at a low altitude throughout the day. Merville, Estaires, Steenwerck, La Gorgue, the Chaulnes railway junction and the docks at Ostend were heavily bombed.

"Fourteen hostile machines were brought down, two were driven down out of control and one as shot down back of our lines by anti-aircraft fire. One of our machines is missing.

"During the night twenty-one tons of bombs were dropped on different targets, including Roulers, Merville, Armentieres, Baupaume, the railway stations at Chaulnes, Thorout, Tournai and Courtrai and the docks at Zeebrugge. Direct hits were obtained on all these targets, and several fires were started. All our machines returned.

The Admiralty has issued the following on April 24th:

"In to-day's German wireless the following statement appears: 'From papers found on American aviators who were shot down it has been proved that for their own safety many of them crossed over on hospital ships, certified as members of the American Ambulance Service in France.'

"The Secretary of the Admiralty makes the following statement: 'No hospital ship, British or American, has ever carried anybody but invalids and the necessary medical staff. Further, there are no hospital ships working on the 'cross-Channel route. The whole statement, therefore, is a fabrication. The American naval authorities state that they have some few aviators who were in the Allied ambulance service in France before the United States came into the war, but even in such cases these men crossed the Atlantic in ordinary ships, taking their full chance of being torpedoed.' "

An official statement issued April 27th on aerial operations says:

"Except for low reconnoissances on the battlefront Friday little flying was possible owing to the thick mist.

"Two low flying German aeroplanes were brought down by our infantry. None of our machines are missing."

The Air Ministry announced on April 27th, that the number of bombs dropped by the British over enemy lines in France opposite the British front during March, was 23,099 by day, and 13,080 by night. The enemy dropped in the area occupied by British troops 517 by day and 1,948 by night.

Despite reports from Berlin to the contrary, great damage was done on April 23rd by the British in their raid against Zeebrugge and Ostend. The accounts of some of those who were in the action show that it was one of the most gallant episodes of the war. An official bulletin issued on April 24th by the British Admiralty says:

"Following the naval operation on the enemy's coast yesteday morning, observations were made by aircraft and bomb attacks carried out. Observation was difficult owing to the clouds, and on this account our machines descended as low as fifty feet.

"A clear break twenty yards wide was observed in the Zeebrugge Mole at its inner end. At Ostend a sunken object was seen lying between the piers and blocking the greater part of the fairway.

"Numerous bombs were dropped on objectives on shore."

The Order of Knight Commander of the Bath has been conferred on Admiral Keyes in recognition of his services in command of the operations against Zeebrugge and Ostend. Commander Carpenter for his services in command of the Vindictive has been promoted.

A British airman bombed Zeebrugge mole while the kaiser was inspecting the results of the recent naval raid there, according to news from Copenhagen.

The kaiser remained on the mole and completed his inspection.

Vice-Admiral Schroeder, the commander at Zeebrugge, according to reports reaching here, will be deprived of his command for being taken by surprise by the British.

In urging the British nation to an increased output of aeroplanes "The Daily Mail," in an editorial, dwells on the importance for Germany of Russia's defection as affecting supremacy in the air. Russian aeroplanes, it says, had great reputation in Germany, and some of them had been used as models by German manufacturers, according to Associated Press correspondence.

"The collapse of Russia," it adds, "enables Germany to exploit and turn to its own use all factories and aerodromes in Russia, and as many more as Russian labor, now looking around hungrily for a job, can be induced to construct. Factories for the manufacture of certain types of machinees are springing up from Petrograd to Moscow, not to mention those already in existence which are, or soon will be, German."

"The Daily Mail" specifies eight existing establishments, including the Korpusnoi aerodrome in Petrograd, the largest in Europe.

Photographs can be taken at the rate of one a second with the new multiple aeroplane camera used by the Allied airmen, according to "The Daily Express," of London. In this way it is possible to map the German lines with marvellous precision.

One multiple camera alone is capable of 750 exposures with a single loading. The secret of this great capacity lies in its use of ordinary motion-picture film, the turning of the film for a new exposure being accomplished automatically.

ITALY

The Italian official announcement for **April 26th states that two aeroplanes were destroyed by Italian aviators.**

The Italian official announcement for December 26th states that two aeroplanes were destroyed by Italian aviators.

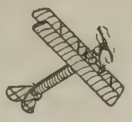
Italian seaplanes made a reconnaissance over the Austrian naval base at Pola and also over Rovigno, bombing destroyers and merchantmen, said a press dispatch from Rome, dated April 26th.

Two bombs struck an Austrian destroyer—a large Austrian warship in the Fassave Canal, and several merchantmen were also shelled. One Austrian seaplane was brought down.

One of the Italian seaplanes was compelled to alight on a choppy sea. A daring rescue was made by an Italian pilot from another machine who swooped down, rescuing the pilot of the disabled aircraft.

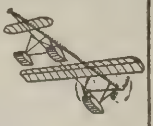
The Italians got back to their bases although heavily shelled.

The raid was made on April 22nd.



MODEL NEWS

Edited by J. F. McMahon



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Oxford, Pa.

Important Announcement to Model News Readers

AERIAL AGE is fortunate in having secured the services of Mr. John F. McMahon as its Model News Editor. Beginning with the next issue, Mr. McMahon will take charge of this department, and with the cooperation of the model clubs and individual model fliers throughout the country, will further the interests of this important and instructive branch of aeronautics.

Mr. McMahon is well known to model builders in the vicinity of this city, as his connection with model flying dates back to about 1910, when the sport did not receive the support and interest it does now. One of McMahon's models was the first to fly over 2,000 feet, and he has participated in and won numerous model and glider competitions. Many fliers will remember the success of his experiments with compressed air engines and compressed air driven models.

In 1912 McMahon was Scretary of the Long Island Model Aero Club, and he has been closely associated with model activities since that time. The secretaries of all Model Clubs are requested to correspond with our Model Editor, who will arrange to publish reports and club notices from time to time.

Photographs and descriptions of models for publication on the Model News page are especially desirable, and their receipt will be prompt acknowledged. Young men who were model fliers, and now engaged in various branches of the United States air forces, are asked to write telling how their model experience has assisted them in becoming acquainted with the work they are doing to make America supreme in the air.

(Address all communications to: John F. McMahon, Model Editor, Aerial Age Weekly, 280 Madison Avenue, New York City.)

Mr. John F. McMahon, who is now Model Editor of Aerial Age Weekly

The Future of the Mechanical Driven Model

By Edwin A. Jenkins

Aeromodellists throughout the world almost unanimously agree that the rubber-strand driven model will be succeeded by the mechanical driven machine. The disadvantages of a rubber strand motor are numerous. At its best, such a motor has a very short life.

There are four main kinds of mechanical motors for models, namely, compressed air, steam, electric, and spring motors. The last two mentioned are out of the question, because of their excessive weight and numerous mechanical difficulties. There remains only the compressed air and steam motors. English model flyers are partial to the steam motor, while Americans favor the compressed air motor. The chief fault of the steam motor lies in its complicatedness and its difficulty to run. There remains only the compressed air model motor. Of these motors, the best are the three and five cylinder rotary types, because these types, being rotary, do not have so much vibration as the stationary types. Thus far the compressed air motor is far from perfect, but with the show of a little ingenuity there is no reason why this type of motor should not eclipse all others in the field.

Early Model Experiments

By F. J. Camm

Although the model aeroplane represents in miniature the embodiment of the same basic laws as those which apply to the full-size machine, yet so simple has its manipulation become (partly owing to the standardization which has taken place in flying models, *i.e.*, those not possessing a full-size prototype) that few of those who fly the model aeroplane ever appreciate the vast amount of endeavor which has conduced to the comparative simplicity with which it is now possible to fly them. That endeavor represents the work of the pioneers —men who, devoted their life to the problem of artificial flight, sacrificing their money with no thought of tangible reward save what success might germinate from their work. They knew, these tyros, that a gulf of probably two or three centuries separated them from the consummation of their hopes. Each only hoped that when, perchance, senility terminated his efforts, one term at least might be eliminated from the equation, and the solution brought so much nearer.

And yet they had a reward—the reward meted out to most pioneers in all branches of science: termed "cranks," classed with seekers of perpetual motion, and (the inevitable conclusion of the sequence) their work appreciated at its true value, and their name revered long after their obituary had been written.

The results obtained by many of these experimenters are scattered through a great number of tomes, musty with age, which now repose, surrounded with a halo of academic interest, in the libraries and archives of divers societies and institutes connected with the science of aeronautics.

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Why He Was Apprehensive

Sandy McTavish was a skilled worker in an aircraft factory. After hesitation he agreed to make a flight with the star tester. During the flight the aviator asked how he was enjoying it.

"To tell the truth," said Sandy, "I would rather be on the ground."

"Tut tut, I'm just thinking of looping the loop."

"For Heaven's sake, don't do that!" yelled the now very nervous Sandy, "I've some silver in my vest pocket!"

Exposing His Ignorance

Landsman: "What's the horse-power of that engine you're running?"

Jackie: "It's got no horse-power. Can't you see its a donkey engine?"

Essential

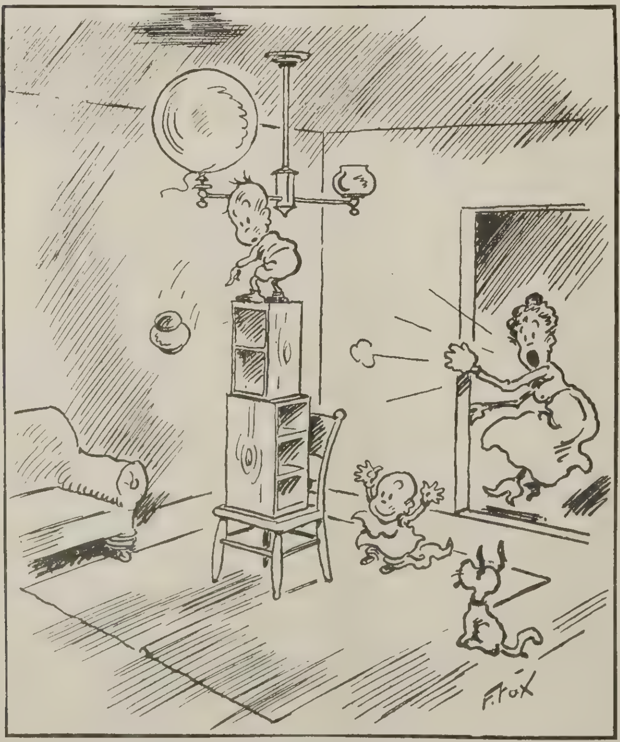
The novice was not enjoying his first trip through the air, and his more experienced companion regarded him in some amusement.

"I say, Bill, what's on your mind?" he demanded.

"I was just thinking about Abraham Lincoln," replied Bill, thoughtfully.

"Abraham Lincoln?"

"Yes, I was thinking how truthful he spoke when he said a man's legs ought to be just long enough to reach the ground."



Little Egbert's best stunt this week was an almost successful attempt to get his balloon filled with real gas.—F. Fox, in the N. Y. Evening Sun.

The Maiden Trip

The captain puffed at a bulldog pipe
  And a gleam was in his eye;
For he feared no foe in the earth below
  Or up in the azure sky.
The day was fine, and the hour was noon,
When we both set off in a kite balloon.

'Twas a maiden flight in that respect,
  But we didn't care a rap;
For we'd wandered wide in a Martinsyde,
  And figured in many a scrap.
A kite balloon was a school-kid's toy,
A pastime planned for an infant boy!

We took a luncheon basket up,
  And we had it stocked right well
With a leg of ham, and some buns and jam,
  And a sparkling Muscatel.
For we meant to do the thing in style,
And to make the merry game worth while!

But when we had soared three thousand feet
  We weren't in the mood for mirth;
For the car it rocked till be both were crocked,
  And felt like nought on earth.
"Oh, nevermore!" the captain cried,
As he lovingly lurched towards the side!

For over an hour we hovered there
  Like criminals on the rack;
We bumped and swayed like a drunk parade,
  Or a squad of men on "pack."
We murmured a deadly Hymn of Hate
And bitterly strafed at our sorry fate!

We descended then, with pallid cheeks,
  And with doleful, downcast eyes;
And we felt no more like dogs of war
  And conquerors of the skies.
May our next exciting flight be soon,
But not—oh, not in a kite balloon!

G. R. S.

The Aviator's Philosophy

Of two things, one thing is certain. Either you're in the air or you're on the ground.

If you're on the ground there is no need to worry. If you're in the air, one of two things is certain. Either you're flying straight or you're turning over.

If you're flying straight there is no need to worry. If you are turning over, one of two things is certain. Either you fall or you don't.

If you don't fall, there is no need to worry. If you do fall, one of two things is certain. Either you're injured or you're not injured.

If you're not injured, there is no need to worry. If you're injured, one of two things is certain. Either you're injured slightly or you're injured seriously.

If you're injured slightly, there is no need to worry. If you're injured seriously, one of two things is certain. Either you recover or you die.

If you recover, there is no need to worry. If you die, you can't worry.—From *The Aileron,* the organ of No. 1 Training Depôt Station, R.F.C.)

Gillette Safety Razor

Have You Seen the New Gillette Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

Hundreds of officers and men are buying them — the U. S. Service Set in metal case, and the new Khaki-covered sets for Uncle Sam's soldiers and officers.

The Gillette is the one razor for the man who is doing things — the one razor with world-wide use and reputation.

When a man wants new Blades he can get them at any Post Exchange or Y. M. C. A. Hut — here in America or Overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

The Name "Gillette" Means the Same Thing to Every Fighting Man

THE severest test of the usefulness of anything is—will it fit the soldier's need.

The fighting men of the Allied Armies and Navies use more Gillettes than of all other makes of razors put together.

They have proved the quality of the Gillette shave—with even the most tender skin and the most stubby beard.

There isn't a shaving condition anywhere on earth that the Gillette hasn't solved—No Stropping, No Honing—blades always sharp, always ready.

If you have a boy or a boy friend in the Service, or likely to be called to the Colors give him a Gillette—complete, compact, no strops or hones to clutter up the kit.

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building and loan associations, two public markets, nine parks within the city limits, two summer resorts,—Waldemeer and Four Mile Creek,—with bathing facilities as fine as can be had at the seashore resorts.

The Pennsylvania Gas Company furnishes the city with natural gas for fuel and lighting purposes at 37 cents per thousand cubic feet. This gas is piped direct to Erie from the adjacent gas fields of Pennsylvania and has been the chief source of fuel supply for our citizens since 1885.

The assessed valuation of real estate within the city limits on January 1, 1918, was $56,839,892 (actual valuation estimated at over $75,000,000). This does not include exempted real estate with an estimated valuation of $4,406,754.

Erie has commission form of government, municipal control being vested in a mayor and four members of council.

The school property, with a valuation of $2,500,000, is managed by a school board consisting of nine members elected at large. A vocational High School, said to be the finest in Pennsylvania, is now being erected at a cost of $700,000, and adjoining it there will be a stadium with a capacity for seating 12,000 persons.

The city's fire-fighting facilities are among the best in the country, having a full paid department of 107 men and modern equipment.

The city maintains its own garbage incinerating plant and collection system and operates its own asphalt repair plant.

Erie has no slums and its many charitable institutions take good care of its sick and unfortunate.

Among the municipal improvement activities under way, contracts have been made between the city and the New York Central and Pennsylvania railroads for the building of six subways and a new union depot at a cost of about $2,000,000, the entire building program to be completed by May 1, 1921. The work of covering Mill Creek and Garrison Run, the building of a sewage disposal plant, the erection of yet another High School, and other large grade school buildings; also many miles of new pavements contracted for means that several millions of dollars more have been provided that Erie shall be even a better place to reside than now.

Opportunities Which Erie Offers

After a careful survey of the diversified industries of our rapidly growing city, it is believed there might be established within the city of Erie, with profit to those who have the capital and know their business lines thoroughly, factories which will manufacture automobiles, cutlery, aeroplanes, rolling mill products, boiler plates, boiler tubes, ships, furniture, agricultural implements, paving brick, knitted goods, hosiery, clothing and shoes. Erie's land locked harbor offers a particularly desirable location for the establishment of ship yards and plants for the buildings of aeroplanes and hydroplanes.

AKRON—THE CITY OF OPPORTUNITY

By VINCENT S. STEVENS

Secretary, Akron Chamber of Commerce

AKRON, Ohio, the foremost city in the world in the manufacture of rubber tires and other rubber products, has gained an added distinction in becoming the city upon which the war department of the United States depends mainly for the construction of lighter-than-air craft.

A large number of dirigibles, spherical balloons and captive kite balloons are being built by the Goodyear Tire & Rubber Co. and the B. F. Goodrich Co.

The balloons are assembled and tested at the Goodyear Tire balloon field at Wingfoot Lake, a short distance from Akron. A dirigible balloon training school is operated at the field for the government, and eighty marines are now being instructed to become pilots. Nearly every day one or more spherical balloon flights are made from the field and a dozen or more dirigible flights.

Akron's place in the field of lighter-than-air craft manufacture is largely due to the experiments made by the Goodyear Tire & Rubber Co. in the early days of the industry, when practically all balloons were made of varnished fabrics. Believing that balloons made from rubberized fabrics would be greatly superior, experiments were made which finally resulted in a perfect product.

In 1911 the famous "Goodyear" balloon was built, a spherical racing balloon of 80,000 cubic feet capacity. The "Goodyear" won the national race in this country in 1913 and again in 1914. It also won the International Race for the James Gordon Bennett cup out of Paris, October 12, 1913. In this race the balloon traveled 550 miles, crossing the English Channel and landing in England after being in the air 43 hours.

At the time of the entrance of the United States into the war, the Goodyear Tire & Rubber Co. was the only company in the country equipped to manufacture balloons constructed from rubberized fabric. It was in a position to immediately begin filling orders for the government. The B. F. Goodrich Co. soon entered the field and is now turning out various types of balloons under government orders. These were first assembled and tested at Chicago, but later, to save time, arrangements were made to have this done at the Goodyear field.

Besides lighter-than-air craft, Akron industries are actively engaged in the manufacture of aeroplane tires and other accessories of aeroplanes in which rubber is a part of the composition. In addition to the Goodyear Tire & Rubber Co. and the B. F. Goodrich Co., the Firestone Tire & Rubber Co. and the Miller Rubber Co. are working on large orders.

The rubber industry was started in Akron in 1869, and it has grown until now there are twenty-four rubber companies in this city, with an aggregate capitalization of about $175,000,000, and they employ about 51,000 persons in the manufacture of many thousand different kinds of articles in which rubber is used.

Honor the Brave

Blood is mantling in the face,
Indignation fills the heart
At thought our great and noble race
Should fail to do its obvious part,
To those who venture in the air,
Who freely risk their limbs and lives,
Who glory in the very dare
To save our homes, our babes, our wives.

On "matador" of cruel Spain
A golden shower falls each day
For slight risk run in giving pain
To poor, dumb brutes when brought to bay.
The force that makes all nations grand
Is stimulation of the brave,
Appreciation of the stand
Their heroes take on land and wave.

And shall our eagles of the skies,
Who rush our country to defend
Be forced to deem their sacrifice
Is but a useless way to end?
Oh shame upon Ameria
That she should cut the "living wage"
Of men who venture near and far
Protecting her from Hunnish rage.

Then wipe the stain from off our shield
With gen'rous hand the brave reward,
And send them out in air or field
With well-filled purse and finest sword.

George L. Upshur.

Berckmans Scout Camouflaged

This is the first American-built camouflaged airplane. It is equipped with 100 h.p. revolving engine and can climb higher than the Woolworth Building and also return to earth in a single minute. It is Valsparred.

Airplanes Camouflaged with Valspar's Aid—

The new system of camouflaging used on this Berckmans Scout was invented by W. A. Mackay, an American, and Valspar (also American) is an important factor in its success.

To insure absolute permanence under varying conditions of service the non-fading monochromatic colors which produce the camouflage *are ground in Valspar.*

The marvelous durability of Valspar, under all the superstrenuous trials of active war-service, has given it the supreme position as the varnish for both airplanes and seaplanes in the Allied service.

Valspar is used by the American and Allied governments because it is not only water-proof but resists the action of gasoline, oils, and greases, and is immune from weather conditions.

Valentine Products used by the world's leading airplane-makers include: Valspar Varnish, Valspar Bristol Enamel, Valspar Olive-Drab Enamel, Valspar Low Visibility Gray Enamel; Valspar Black Enamel, Valspar Filler (Wood), Valspar Primer (Metal), Valspar Primer (Wood), Valspar Khaki Enamel, Valspar Aluminum Paint. Dipping, Spraying and Brushing coatings of all kinds, Quick-Drying Insignia Colors.

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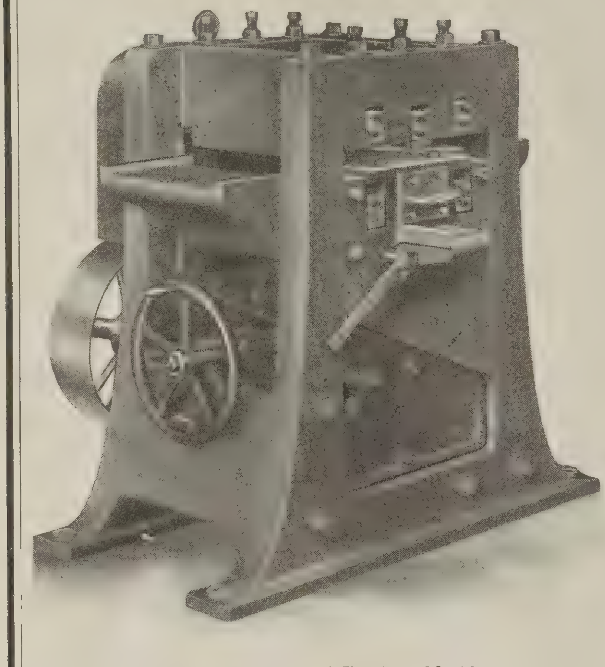
Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY Toothing Machine



Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog and samples of toothing

Baxter D. Whitney & Son

WINCHENDON MASSACHUSETTS

(*Continued from page* 405)

V

Van Surdam, Henderson E.	CSO
Valentine, Allen Wilson	SLR; FRF
Van Tuyl, Anthony	FRF
Venton, Wilson L.	SLR
Vernon, Fred	SLR
Veith, John W.	TMA

W

Wells, Frederick L.	REL; Note 9
Wordell, Frank Read	REV
Weaver, Earle Fellencer	SLR; CSO
Webb, Elmer C.	Note 4
Warber, Frederick P.	REV
Woolford, Brooks R.	EOT
Webster, Buel L.	DIS
White, William A.	FRF
Wood, Joseph J.	FRF
Weeden, Charles F., Jr.	HHN
Watter, Carl F.	FRF
Wood, Norman R.	FRF
Woods, Palmer P., Jr.	FRF
Wascher, Frank E.	DIK
Wettlaufer, Ralph C.	DIK
Whiting, Brian F.	FRF
Williams, Isaac J.	FRF
Winterton, Roland J.	FRF
Walton, Charles W.	DIK
Wash, Carlyle G.	SAG
Wilson, William B., Jr.	WFO
Wagner, Parker	SLR
Wahle, Chester Davis	SLR
Wait, Harry W.	SLR
Walker, Stephen Pillsbury	SLR
Walton, Charles W.	SLR
Washburn, George Henry	SLR
Watson, William	SLR
Wehrell, Albert J.	SLR
Welch, Paul R.	SLR
West, William W.	SLR
Wettlaufer, Ralph C.	SLR
Wyman, Wallace	SLR
White, Chester M.	SLR
White, Joseph Talbert	SLR
Whitfield, Raoul F.	SLR
Whiting, Brian Fairfax	SLR
Wilcox, James W.	SLR
Williams, Isaac Jackman	SLR
Winkle, William E.	SLR
Winterton, Roland John	SLR
Wood, Horace Walter, Jr.	SLR
Wortley, Franklin	SLR

Y

Young, Benjamin C.	Note 4

Z

Zimmerman, Thomas J.	FRF

(*Continued from page* 392)

1½ inches deep at the ends, curving thence to a point in the center, where the depth shall be 3 inches; the two lower pockets are to be cut bellows style, 9 inches deep, 8½ inches wide at the to pand 9½ inches wide at the bottom, inside measurements, the piece to form the bellows is to be 2½ inches wide, inside measurement, one edge to be seamed and stitched to the pocket, the other to be turned in and neatly stitched to the coat, the corners to be mitered so as to make the pocket lies close to the coat, the lower edges of the pocket and bellows piece to be rounded, these pockets to be sewed close to the bottom of the coat. There shall be a flap of two-ply cloth stitched 1 inch above each lower pocket opening 3½ inches wide at the point in the center and curving to 1½ inches wide at each side; there shall be a button hole worked vertically in the point of the flap, the flap to be stitched to the coat on a horizontal line with the bottom button. Extending from the neck at the front of the coat on each side to the top of each upper pocket there shall be two welted gore seams about 1½ inches apart at the collar and 2 inches apart at the top of the pocket. Inside pockets may be added if desired. Material to be of forestry green as prescribed in Uniform Regulations, U. S. Marine Corps, for winter field service.

Note.—Officers or student officers will not be required to have coats in their possession altered to conform to the foregoing changes.

Breeches.—To be of same pattern as winter field breeches, Uniform Regulations, U. S. Marine Corps. Material to be of forestry green.

Trousers.—To be of same pattern as undress trousers, Uniform Regulations, U. S. Navy. Material to be of forestry green. To be worn when leggings are not worn.

Overcoat.—To be of same pattern as the Uniform Overcoat Regulations, U. S. Navy. Material will be of forestry green. Shall be knee length and shall have five plain, brown buttons, 1½ inches in diameter, on each front. Lower buttons placed about three inches below the sword belt, the others equally spaced up to the throat. Sleeve stripes shall be brown.

Gloves.—Brown.

Caps.—Similar to service blue caps, Uniform Regulations, U. S. Navy, except that top will be of forestry green material.

Shoes.—High laced shoes of tan leather.

Leggings.—To be of tan leather and of the pattern known as "puttee."

Flannel shirts.—Similar to flannel shirts, Marine Corps Regulations.

Shoulder marks.—As per Uniform Regulations, U. S. Navy, except that shoulder marks to be worn on coat shall be sewn on and shall be worked over hair cloth or similar stiffening material. Shoulder marks on overcoat will be worn as on blue service overcoat.

Buttons.—As per Uniform Regulations, U. S. Navy.

SUMMER FLIGHT SERVICE

To be the same as winter flight service except that material shall be lighter in weight.

RAINCLOTHES

Raincoat.—To be of rubber cloth or waterproof material; of the same pattern and color as the winter flight service overcoat except that the bottom shall reach to within 12 inches of the ground, and the middle point of the opening of the pockets shall be level with the elbow. There shall also be a slash vent open through the coat at the opening of the pocket. Sleeve stripes shall be worn, but shoulder marks will be omitted.

Rainproof cap cover.—To be of waterproof material; the color to be approximately the same as the flight service uniform.

WORKING DRESS

To be a one-piece overall suit, capable of being worn over uniform and to be made of canvas, khaki or moleskin.

Naval aviator's device.—Device for naval aviators will be a winged foul anchor to be worn by qualified naval aviators. This device will be issued by the Bureau of Navigation to officers and men of the Navy and Marine Corps, who qualify as naval aviators, and will be worn on the left breast.

Summer and winter flight uniforms only will be required of officers of the Naval Reserve Flying Corps, but they may provide themselves with Navy service uniform as prescribed for Naval Reserve officers, if they so desire, to be worn when not on duty specified below. Summer or winter flight uniforms will be worn by all officers on aviation duty attached to naval air stations and naval aviation detachments, ashore, and may be worn on duty in connection with inspection or tests of aircraft and their material, and on such other occasions as may be prescribed by competent authority.

STUDENT OFFICERS

Caps.—To be the same as for commissioned officers, except that chin straps will be ¼ inch in width, and the device will be the same as that worn by midshipmen. This cap device is a gold foul anchor in a vertical position, total length 1¾ inches, width 1⅛ inches.

Shoulder marks.—Will not be worn.

Leggings.—Student officers will wear the wrap leggings instead of the leather puttees.

Approved April 1, 1918.

JOSEPHUS DANIELS,
Secretary of the Navy.

—*From Army-Navy Journal.*

SPERRY

PIONEERS
In The
MANUFACTURE
of
AERONAUTICAL INSTRUMENTS
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THE SPERRY GYROSCOPE Co
MANHATTAN BRIDGE PLAZA
BROOKLYN NEW YORK
15 VICTORY STREET LONDON S.W.I. 126 RUE de PROVENCE PARIS.

(*Continued from page* 395)

Span or spread: The maximum distance laterally from tip to tip of an airplane wing, or the lateral dimension of an aerofoil.

Stability: A quality in virtue of which an airplane in flight tends to return to its previous attitude after a slight disturbance.

- *Directional*.—Stability with reference to the vertical axis.
- *Dynamical*.—The quality of an aircraft in flight which causes it to return to a condition of equilibrium after its attitude has been changed by meeting some disturbance, e. g., a gust. This return to equilibrium is due to two factors; first, the inherent righting moments of the structure; second, the damping of the oscillations by the tail, etc.
- *Inherent*.—Stability of an aircraft due to the disposition and arrangement of its fixed parts—i. e., that property which causes it to return to its normal attitude of flight without the use of the controls.
- *Lateral*.—Stability with reference to the longitudinal (or fore and aft) axis.
- *Longitudinal*.—Stability with reference to the lateral axis.
- *Statical*.—In wind tunnel experiments it is found that there is a definite angle of attack such that for a greater angle or a less one the righting moments are in such a sense as to tend to make the attitude return to this angle. This holds true for a certain range of angles on each side of this definite angle; and the machine is said to possess "statical stability" through this range.

Stabilizer: Any device designed to steady the motion of aircraft.

Stagger: The amount of advance of the entering edge of the upper wing of a biplane over that of the lower, expressed as percentage of gap; it is considered positive when the upper surface is forward.

Stalling: A term describing the condition of an airplane which from any cause has lost the relative speed necessary for control.

Statoscope: An instrument to detect the existence of a small rate of ascent or descent, principally used in ballooning.

Stay: A wire, rope, or the like used as a tie piece to hold parts together, or to contribute stiffness; for example, the stays of the wing and body trussing.

Step: A break in the form of the bottom of a float.

Stream-line flow: A term in hydromechanics to describe the condition of continuous flow of a fluid, as distinguished from eddying flow.

Stream-line shape: A shape intended to avoid eddying and to preserve stream-line flow.

Strut: A compression member of a truss frame; for instance, the vertical members of the wing truss of a biplane.

Suspension band: The band around a balloon to which are attached the basket and the main bridle suspensions.

Suspension bar: The bar used for the concentration of basket suspension ropes in captive balloons.

Sweep back: The horizontal angle between the lateral axis of an airplane and the entering edge of the main planes.

Tail: The rear portion of an aircraft, to which are usually attached rudders, elevators, stabilizers, and fins.

Tail cups: The steadying device attached at the rear of certain types of elongated captive bolloons.

Thimble: An elongated metal eye spliced in the end of a rope or cable.

Tractor: See Airplane.

Trailing edge: The rearmost edge of an aerofoil or propeller blade.

Triplane: A form of airplane whose main supporting surface is divided into three parts, superimposed.

Truss: The framing by which the wing loads are transmitted to the body; comprises struts, stays, and spars.

Undercarriage: See Landing gear.

Warp: To change the form of the wing by twisting it.

Wash out: A permanent warp of an aerofoil such that the angle of attack decreases toward the wing tips.

Weight: Gross. See Load, full.

Wings: The main supporting surfaces of an airplane.

Wing flap: See Aileron.

Wing loading: The weight carried per unit area of supporting surface.

Wing mast: The mast structure projecting above the wing, to which the top load wires are attached.

Wing rib: A fore-and-aft member of the wing structure used to support the covering and to give the wing section its form.

Wing spar or wing beam: A transverse member of the wing structure.

Yaw: To swing off the course about the vertical axis.

- *Angle of*.—The temporary angular deviation of the fore-and-aft axis from the course.

Thomas

THOMAS-MORSE AIRCRAFT CORPORATION

ITHACA, N.Y. U. S.A.

Contractors to U.S. Government

(*Continued from page* 399)

by the handicraft of the workman. In good modern jig practice, hand tools are entirely prohibited. The reason for this is that all parts, however small, should be made in their own particular jigs. If at any time it is discovered that a part does not fit correctly into its proper place, hand tools must not be used to correct the deficiency, but rather the fault which caused the defect must be eliminated from the worn or incorrect jig originally used to make that part.

A description of the whole art of the design of jigs and fixtures would require a voluminous treatise. As neither space nor time will permit of such full treatment here, it is proposed to summarize in the form of a running commentary a few of the main points that are often overlooked.

Saw Mill Jigs

A great deal of subsequent work can be saved if the preliminary rough sawing is done to close limits of the finished sizes. This can be accomplished by means of suitable jigs, which can be clamped on to the timber and serve as guides. During sawing, the guiding portions would be kept by the sawyer in contact with fences on the saw bench.

Spindling Machines

With the aid of carefully thought out jigs, these machines are invaluable to an aeroplane manufacturer. At the present time they are not utilized to anything like the extent to which they should be for lack of jigs. Preferably suitable ball races should be fixed on the projecting portions of the spindles for the jigs to bear against and thus reduce jig wear to a minimum. As far as is feasible, safety tool holders should be employed, for not only are they a protection to the operator, but they also facilitate the setting of the tool and the cutting edge is more easily arranged at the best cutting angle.

No hand tool work should be permitted in an aeroplane factory. Hence, all parts, even the smallest, should be made on spindling machines of some kind. With the aid of proper jigs it is really wonderful what work can be done in this direction. For light work it is not essential to employ the heavy standard spindling machines, as some manufacturers have successfully employed short ball bearing shafts, which have been fixed in a vertical position on stout wood framework.

Jigs for small parts should be so constructed that several pieces may be spindled at the same time; if the clamping arrangements are adequate the several pieces will lie flat and the finished shapes will be identical.

Color Scheme

These various small pieces should be stored in separate boxes or bins. All the boxes or bins containing the pieces for one particular component should be painted a distinctive color or combination of colors. The jig in which these parts are assembled should be painted the same color or combination of colors. This materially assists the operatives, and is a scheme which might be standardized throughtout the country.

Tools and Gauges

All special form cutters should be made to designs prepared in the jig and fixture drawing office. This will ensure all sub-contractors turning out identical parts. The tools should be set in the various machines to gauges and not to pattern parts. These gauges should be designed in the drawing office. Then all sub-contractors would have to set their tools to perform exactly the same work and incidentally save considerable time.

All cutters and gauges should be made in quantities in a tool-room, similar to an engineering works tool-room. An operator should not be allowed to do anything to a tool more than just stone it up in position. The tools should be set in the spindle to a gauge and not to a pattern part. By this means any number of sub-contractors will be in a better position to produce identical parts.

All tools and gauges should be made to special drawings and not according to the operator's ideas in the various shops. Thus, a complete record is kept of how to do a job, and it is an easy thing to start a new workman in the way he should go.

If proposed use is made of jigs, tools and gauges, it will be impossible to turn out work that is not correct, although the worker may have no experience of aeroplane work at all.

Special Tool Steels

.It is put forward that undoubtedly superior steels should be employed for wood working than those now utilized. This would permit of the machine tools operating at higher speeds than they do at present, which would result both in a bigger output and better work. Machines which now run at 5,000 revolutions per minute could be speeded up to something like 7,000 revolutions per minute. It is true that this would shorten the life of each machine, but much better and quicker than work would be done.

Special Shop to Make Jigs, Tools and Gauges

It is suggested that since most aeroplane sub-contractors have no tool-room facilities, a special jig and tool shop should be run in connection with the drawing office to manufacture all tools, jigs, etc., which sub-contractors are not in a position to make for themselves. Then tools and gauges could be turned out in quantities and sub-contractors would be assured of a good supply to assist them in their efforts to attain maximum production.

Much could certainly be learned from metal milling practice that could advantageously be applied to the operation of spindling machines. In fact, inverted spindle machines with face cutters are already in use. Horizontal spindles could also undoubtedly be employed with advantage.

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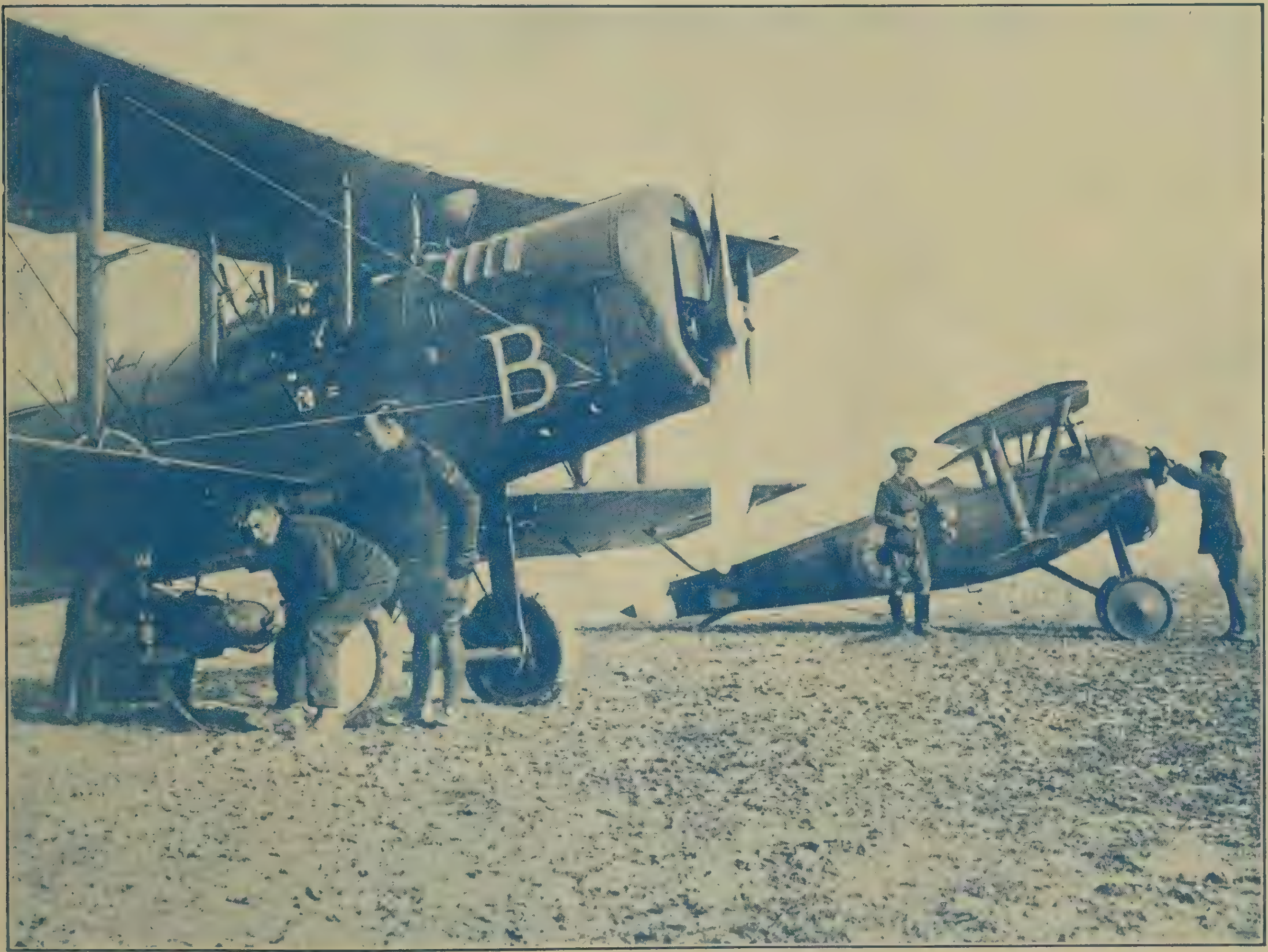

A Daylight bombing machine and the Nieuport combat machine which will accompany it, prepare for a daylight bombing raid on the Western front. (British Official Photo.)

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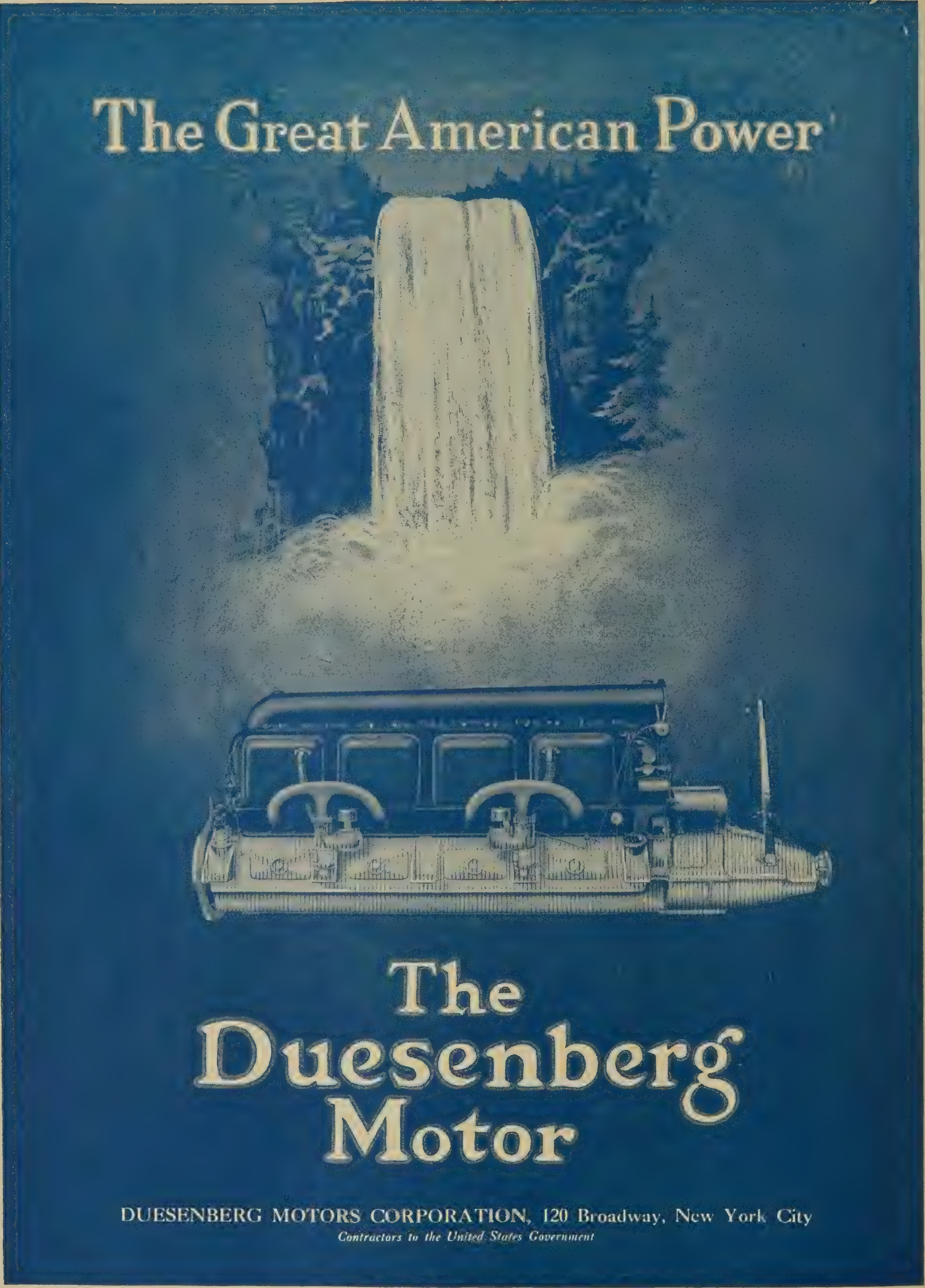
Another Billion for Aeronautics

President Wilson Orders Judicial Aircraft Investigation



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URGE ALLIED AIR GENERALISSIMO

THE allied control of the air becomes more marked from day to day. It had a great part in checking the German offensive plans. Now the allied aerial forces are so much stronger than those of the enemy, this superiority must be maintained. The best way to accomplish this, is to make an experienced and capable man commander of all the allied aviation organizations, just as General Foch commands all the allied land forces. General Mallelere, writing in the Paris *Temps* on the various offensive arms, speaks at length of the future role of aviation, saying in part:

"It does not seem as if the Germans obtained from aviation what they expected for their offensive. Perhaps they could not expect more. We now know that at least on the battlefield Franco-British aviation played almost the role of salvation. In co-operation with the rapid intervention of French troops in the breach caused by the retreat of the Fifth British Army, and on retarding the advance of the enemy columns by means of its machine guns and bombs it confirmed the part which the airplane can play in a battle even at a low altitude over the combatants.

"But aviation, whose role has been and is so great in this war, is marked by much greater and more efficacious action.

"Aviation has co-operated in the war of attrition and also in various offensive operations. Until the end of 1917 there was no aerial strategy. Aerial strategy comprises attacks on and destruction of the enemy's vital centres—namely, munition factories, mining localities, blast furnaces, large railway depots, bridges, military establishments, and so on, and demoralization of populations believing themselves safe from the danger of invasion. Regarding Germany our aerial tactics should comprise invasion of enemy territories in reciprocity for our invaded and devastated countries. But it would be a great error to consider these solely in the light of reprisals. It is not a question of responding to Germany's barbarous proceedings. We have been compelled to oppose poisonous gas with poisonous gas.

"We must look at war as it is according to the methods of German militarism. Armed Germany is an entirely belligerent nation. Labor outside of the zone of military operations contributes to maintain the strength of the combatants. Whether in the factory or on the land, every one fights. The blockade starves both civilians and soldiers. Aerial warfare must complete the combined work of blockade and battle. If one wants to reach an end he must not stick at the means. Our end is to disarm Germany and make it impossible for it to resume its policy of conquest. The first duty of aviation is to cover the entire zone of operations and to contribute to the battle by the destruction of enemy reinforcements and supplies.

"The second is to aim at the enemy country.

"This strategy of attack and invasion consists of intensive bombardments continued day and night. Bombardment is the final object of aviation."

General Mallelere describes the necessary conduct of aerial warfare and mentions some of the objective points within the enemy territory which may be effectively bombarded—namely, the Lorraine mining regions between the rivers Moselle and Rhine, which have often been raided in past months by Franco-British squadrons; the Rhine valley, teeming with populous and industrial cities, the Main valley, with Frankfort, Karlsruhe, and Stuttgart; the Bavarian plains, with Munich and also Cologne, Wilhelmshaven, Cuxhaven, Kiel and other points accessible to allied hydroaeroplane squadrons. The writer concludes:

"One may judge of the immense result of this aerial strategy by the emotion, not to say terror, created in the Rhenish region by the recent bombardments executed by Franco-British squadrons. When the squadrons incessantly renew their attacks and transforms the Rhine valley into an inferno, other cries of distress will be heard from the enemy. Germany will then feel the effects of this iron fire which it wished to make an instruments of its determination. Such a programme requires thousands of machines. We must and will have them."

PRESIDENT WILSON ORDERS JUDICIAL AIRCRAFT INVESTIGATION

CLIMAX REACHED IN AIRCRAFT INVESTIGATION

FOLLOWING a period of charges and counter charges regarding the aircraft situation, President Wilson turned the whole matter over to Attorney-General Gregory, who was instructed to make a thorough investigation of the "wholesale charges" in regard to the production of aircraft made by Gutzon Borglum, the sculptor.

Another sensational feature was added to the case when it became known that Major Gen. George O. Squier, Chief Signal Officer of the Army, who is accused by Mr. Borglum of hampering the work of investigation undertaken by the latter, had made a request for a military court of inquiry. A court of inquiry which is a sort of military grand jury, which, after investigation, recommends whether court-martial proceedings are desirable. It also expresses opinions as to whether charges affecting an officer or officers are true or without merit.

The President's decision in favor of an investigation was announced after he had received from Howard Coffin, Chairman of the Aircraft Board, who had been South, a telegram urging that an official inquiry be made "in order that the reputations of innocent men may not be ruined."

The announcement of the President's decision was made when the White House on May 6th gave out copies of messages exchanged between President Wilson and Chairman Coffin and a copy of a letter sent by President Wilson to Senator Thomas of the Military Affairs Committee, in which the President expressed the hope that "the matter will be treated as one for searching official investigation by the constituted authorities of the Government" and said that "every instrumentality at the disposal of the Department of Justice will be used to investigate and pursue charges of dishonesty or malversation of any kind."

Letters to Borglum Also Made Public

The President also made public seven letters he had sent to Mr. Borglum or Secretary of War Baker in the last five months in connection with the investigation the sculptor was making into the aircraft production situation. These show that the President in January urged Mr. Borglum to come to Washington, lay the whole matter frankly and fully before Secretary Baker, "and by your own investigation discover the facts in this business," but in April wrote him that "I never at any time constituted you an official investigator."

Mr. Borglum conferred with members of the Senate Military Affairs Committee and furnished a list of men who, he said, could reveal information of irregularities in aeroplane production.

Senator Chamberlain, Chairman of the committee, said on May 6th that no decision had been reached as to an inquiry based on the Borglum charges. The sentiment of the committee, he added, was to allow the Department of Justice to make the investigation. Most of the members of the committee feel that the Borglum charges properly come within the scope of the department. A vote on the proposal to open an inquiry by the committee will be taken within the next few days.

Coffin Telegrams and Thomas Letter

No statement was issued at the White House in connection with the making public of the telegrams. The telegram from Chairman Coffin follows:

"DARIEN, Ga., May 4, 1918.

TO THE PRESIDENT:

Charges of dishonesty have been made against the Aircraft Board, which demand the fullest inquiry. I request and urge that an official inquiry be had in order that the reputation of innocent men may not be ruined.

HOWARD COFFIN."

Here is the President's reply:

Telegram.

"WASHINGTON, D. C., May 6, 1918.

HON. HOWARD COFFIN, Darien, Ga.

Your telegram received. You may be sure I shall co-operate in every way to prevent what you rightly foresee might happen. The Department of Justice will co-operate to the utmost in seeing that all charges are probed and the truth got at.

WOODROW WILSON."

Simultaneously with the sending of his telegram to Mr. Coffin, the President forwarded this letter to Senator Thomas:

"THE WHITE HOUSE,
WASHINGTON, May 6, 1918.

MY DEAR SENATOR:

You were kind enough to consult me the other day about the wholesale charges in regard to the production of aircraft which have been lodged by Mr. Gutzon Borglum. I take the liberty of writing you this letter in order to say more formally what I said to you then informally, namely, that every instrumentality at the disposal of the Department of Justice will be used to investigate and pursue charges of dishonesty or malversation of any kind, if the allegations made by Mr. Borglum are considered worthy of serious consideration, and I sincerely hope that the matter will be treated as one for searching official investigation by the constituted authorities of the Government. Only in this way the reputations of those whose actions have been perfectly regular and blameless be protected and the guilt, if there is any, definitely lodged where it should be lodged.

Sincerely yours,
WOODROW WILSON.

HON. CHARLES S. THOMAS, United States Senate."

The Letters to Borglum

In connection with the Borglum report, it has been freely stated that Mr. Borglum was the "President's investigator" and that his investigation had the sanction of the President. The seven letters made public by the White House throw light on this phase of the matter. The first of the letters reads:

"THE WHITE HOUSE,
WASHINGTON, December 5, 1917.

MY DEAR MR. BORGLUM:

Your letter of November twenty-second to Mr. Tumulty (the President's Private Secretary) he was kind enough to show me, and I had meant to write to you sooner about it. Of course, what you say disturbs me not a little, and I write to ask you if you will not do me the great favor of indicating as specifically as possible the weaknesses you see in our present organization in the matter of aeronautics. I would also appreciate it very warmly if you would tell me what men of practical gifts not now connected with the service of the Government you think could be serviceable to us in working towards a successful result.

Cordially and sincerly yours,
WOODROW WILSON.

MR. GUTZON BORGLUM, Stamford, Conn."

"THE WHITE HOUSE,
WASHINGTON, January 2, 1918.

MY DEAR MR. BORGLUM:

I have your letter of December 25.

Knowing the earnest and loyal purpose with which you have written me, I have conferred with the Secretary of War, and at his request and with my own hearty concurrence, I urge you to come at once to Washington, lay the whole matter frankly and fully before the Secretary, and by your own investigation discover the facts in this business. The Secretary of War assures me that he will be delighted to clothe you with full authority to get at the bottom of every situation, and that he will place at your disposal the services of Mr. Stanley King, a member of his own personal staff, if you desire to have his counsel in your inquiries. The Secretary further says that he will bring you into personal contact with General Squier, whom you doubtless already know personally, and will direct that every facility of inquiry be placed at your disposal. When you have thus investigated, if the other experts whom you suggest in your letter of December 25 still seem desirable to be appointed, you can say so to the Secretary; and, in the event of any difference of judgment between you, which seems to me impossible, I would be most happy to have a report from you personally to me on any phase of the matter which remains in the slightest degree doubtful in your mind.

Cordially yours,
WOODROW WILSON.

MR. GUTZON BORGLUM, Borgland, Stamford, Conn."

Report Referred to Baker

Mr. Borglum's report was completed in January and submitted to the President, who on February 1 sent it to Secretary Baker, with this note:

"THE WHITE HOUSE,
WASHINGTON, February 1, 1918.

MY DEAR BAKER:

Here is Mr. Borglum's preliminary report. Is there not some one entirely disconnected from aeronautics and from those who are prominent in carrying out the aeroplane program whom you can ask to go over this thing with an unbiased mind and give us his naive impressions of it? There may be something worthy of our consideration and suggestions worthy to be adopted.

Cordially and sincerely yours,
WOODROW WILSON.

HON. NEWTON D. BAKER, Secretary of War."

A letter written on March 15 to Mr. Borglum by the President read:

"THE WHITE HOUSE,
WASHINGTON, March 15, 1918.

MY DEAR MR. BORGLUM:

I have your letter of March 11 and thank you for it. I am writing in great haste to say that the whole aircraft matter is undergoing a very thorough review.

In haste,

Sincerely yours,
WOODROW WILSON.

MR. GUTZON BORGLUM, Stamford, Conn."

At the end of March President Wilson sent this letter to Mr. Borglum:

"THE WHITE HOUSE,
WASHINGTON, March 29, 1918.

MY DEAR MR. BORGLUM:

In view of your telegram of yesterday I am very glad to explain to you what my telegram to you meant. It meant this, that I have now instituted a very systematic inquiry into the whole aviation situation and think it wise that all processes of investigation should be in the charge and under the direction of the gentlemen to whom I have committed this task. I have placed at their disposal the material you were kind enough to furnish me with and can assure you that they will go to the bottom of it all.

I know your own judgment will approve of this.

Sincerely yours,
WOODROW WILSON.

MR. GUTZON BORGLUM, Hotel Pontchartrain, Detroit, Mich."

On April 4 the President sent this communication to Mr. Borglum:

"THE WHITE HOUSE,
WASHINGTON, April 4, 1918.

MY DEAR MR. BORGLUM:

Thank you very much for your letter of yesterday. You may be sure that the whole matter will be and is being gone into to the bottom.

Cordially and sincerely yours,
WOODROW WILSON.

MR. GUTZON BORGLUM, care Metropolitan Club, Washington, D. C."

Not an Official Investigator

The seventh of the letters made public read:

"The White House,
Washington, April 15, 1918.

My Dear Mr. Borglum:

I am afraid that you have for some time been under a serious misapprehension. You call my attention to the fact that you were not supplied with suitable expert assistance in the investigation which you, of your own motion, undertook of the aircraft production.

You will remember that at the beginning you wrote to me saying that you feared and believed that there were very serious errors not only, but serious bad practice, in the aircraft production, and after consulting with the Secretary of War I wrote you that, if it was your impression, you were, of course, at liberty to examine any evidence that was in our possession. *I never at any time constituted you an official investigator. I merely gave you the right to look into the matter of your own motion, and I am sure that the letter which the Secretary of War provided you with he gave you with the same purpose and idea. We have wished at every point to assist you and to make possible for you what you wished to do, but we have at no time regarded you as the official representative of the Administration in making the investigation. If I had so regarded you, I would, of course, have supplied you with such assistance as you feel you have lacked.*

You will understand, of course, that I write this in the most cordial way and only because it is evident from your last letter that you have been laboring under a misapprehension.

I hope that you will be willing and that you feel that it is your duty to put at the disposal of those whom I have constituted official investigators all the evidence that may be in your possession.

Cordially and sincerely yours,
Woodrow Wilson.

Mr. Gutzon Borglum, Metropolitan Club, Washington, D. C."

The italicized matter in the above letter represents, according to the Committee on Public Information, matter underscored in copies of the letter furnished by the White House.

Mr. Borglum gave to the press two letters which he had sent to President Wilson, one of them written May 6th, after the announcement that the President had ordered an investigation of the aircraft situation by the Attorney General. The other was dated January 21.

In both letters Mr. Borglum contended that he had been hampered in his work of investigation and had been obliged to conduct his inquiry without aid. He accused the President of not having given him proper help. Among his allegations were that "officials who should have aided me had intercommunicated, attempted to mislead me and block every avenue I approached." He charged that General Squier had hindered him, and that he got no assistance when he told the Secretary of War of his difficulties.

The letter written to the President by Mr. Borglum May 6th follows:

Text of Mr. Borglum's Letter

"Washington, D. C., May 6, 1918.

Hon. Woodrow Wilson, President U. S. A.:

My Dear Mr. President:

It is something more than a shock that I noticed today the publicity which I could hardly interpret in a friendly manner, considering the order of the statements given and the meaning of your empowering letter to me, and I am taking, therefore, the only course open to me, that of addressing to you a reply, republishing your empowering letter, together with my first letter to you, accompanying my first review of the aeronautic situation.

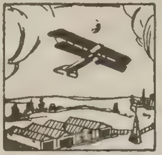
In this I refer to the difficulties I met with in carrying out your wishes that "I go to the bottom of this business." Beyond that I spared you the record of petty intrigue, espionage, and a general system of official bullying that is carried on by, if not at the direction of, great departmental officials, certainly with their knowledge and approval. I had not been in the office assigned to me in the War Department forty-eight hours before I met with the intrigue of that department. Requisitions that I made for data brought untrue or valueless reports, and Mr. Stanley King, whom you had named to be my aid, and whom Assistant Secretary of War had turned over to assist me, began to systematically block the work I was undertaking, to the extent even of threatening witnesses who came to my office, Room 225, War Department, to give me information, and warned that they would give information to me at their peril. General Squier acted in a like manner, and every official that I approached and from whom I had the right to receive aid and courtesy, had, apparently under general instructions, entered into a common conspiracy to deceive, to mislead, and prevent learning the truth about the aeronautic situation. I do not presume to give the reason for this, although I fully realize the sources the periodical statements, false in contents and in purpose, emanating from the War Department regarding aeronautics, would not look with favor upon any inquiry that dealt with the true situation, and so within a week, on January — I abandoned the War Office and secured an office without the building that my investigation might be less prejudiced, and might get more accurately and quickly at the truth of the situation. Nor did I fail to inform Mr. Baker of the serious condition that prevailed, and demanded correction, without avail; this constituted my first grievous offense—I had demonstrated *I* at least would not WHITEWASH. The reports that I sent to you were true, and if they erred at all, they were not strong enough in statement, which a subsequent inquiry has proven and placed amply before the public.

My investigation was a preliminary inquiry. It was so agreed between us, and, further, should I deem it necessary to have two assistant experts they would be appointed, and if there was any difference in opinion between Mr. Baker and myself, you agreed that I should deal directly with you. These experts never were appointed, your promise was not kept and my request, frequently urged upon you, only brought the appointment of men without knowledge, without information and wholly unfitted to inquire in a subject that had failed largely because it was conducted without information and knowledge; that is, had there been a few informed men even remotely connected with that huge appropriation, a few planes would have reached Europe.

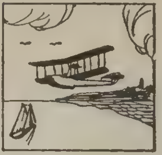
I have pleaded for investigation, consistently and persistently, and I still plead for investigation. I have asked for nothing else but investigation, I have given months and months of valuable time, hoping that investigation would finally come. There has been a great deal of talk and a great deal of noise, but for some strange unaccountable reason, it is impossible to get official action that will really investigate the aeronautic group. The nation knows its billions, or such part of it as they could possibly manage to use, is gone. The nation and all of our boys know that there no planes to protect them, although Colonel Deeds told the National Press Association recently in great confidence that "we had 1,200 fliers with 1,200 planes, all ours, flying over our lines." An officer who has arrived in this country within the week, straight from our troops, informs me we have less than twenty. That they are French school planes. That they are not allowed near the German lines, and that our single balloon is hastily pulled down out of danger as the enemy planes appear.

I was among the first to call official attention to specific weaknesses in the Liberty motor. In spite of the resentment at the time the justice of these criticisms has been admitted by the Chairman of the Aircraft Board, correction made, and they are rebuilding the engines on those lines at this moment, but I had sinned in daring to criticise, and, as some of your most important and prominent associates in our Government have said, Borglum "blundered in telling the truth." I have said the Aero Department is full of profiteering, that hundreds of millions have gone, that factories have been created where there were no factories necessary, and contracts to the extent of fifty millions given to men who had neither rhyme nor reason for the remotest connection with the emergency of aeroplane production, but who had the pull of deeds and who are still floundering in their ignorance and incompetency, unable and incapable of fulfilling their contracts, still drawing under the cost plus system upon the Treasury of the nation. I have said that aeronautic men of ability of the nation have been snubbed and ignored, unemployed, and that factories, or nuclei of factories, that could have been developed into producing institutions, who knew the art of aeroplane building, are even at this writing without the slightest consideration by the group who dealt out the colossal funds for their purpose. I have said the Liberty motors should never have been undertaken until other available motors had been put in production sufficient for an emergency fleet of aeroplanes built that our army could have used when it was ready, and I have said that this was not done because the group who were interested in the production of the Liberty motor were interested in the establishing and controlling of the monopoly of that engine for aeronautic work, and were not interested or at least have never shown interest that protected the troops they were charged to protect. I have also said that there has been gross profiteering in the methods of contracts, and that millions could be saved if the Government would act quickly, even by the consent of the manufacturers themselves. I have pointed out that although the engine was still an experiment there were no planes, there can be no planes and there will be no planes until an engine or the engine is done and a perfect and a completed thing, so the country "believed that when the Liberty motor would reach its production we would have thousands

(*Continued on page* 450)



THE NEWS OF THE WEEK



Another Billion to Build Aircraft Is Asked for Army

Washington, May 6.—A billion-dollar appropriation for aircraft production was asked of Congress by the War Department. This would add to the $640,000,000 appropriation already made and expended.

The estimate was presented to the House Military Committee by Major General March, acting chief of staff, and other officers. At the Congressional hearings it was stated by Signal Corps officials that the $740,000,000 apportioned for aviation has been expended as follows:

The War Department has expended $307,000,000 for aeroplanes as follows:

There is an unexpected balance now on hand of $433,000,000.

Of the unexpended balance, all is covered by contract, and additional contracts have been let for machines and other equipment which provide for expenditures of $148,000,000 beyond the appropriation.

The money already expended has been used as follows:

For engines and aeroplanes and general machine equipment..........	$163,000,000
For hangars and the acquirement of aviation fields in this country....	42,000,000
For aviation fields and other purposes in France.................	31,000,000
For gas balloons.................	5,000,000

There is $31,000,000 in the hands of the disbursing agents and not reported at the hearing.

The balance has been spent for miscellaneous aviation work, for experiments and other general expenses connected with the program.

The Government has ordered 14,000 foreign planes, and 1,800 have been delivered, he said, while 8,000 foreign engines have been contracted for, the deliveries amounting to fewer than 1,500.

There are between 1,200 and 1,400 aviators actually flying with the American forces on the Western front.

There are 5,000 men physically fit and ready to enter the service, while there are 15,000 flying and non-flying aviation service officers in the United States and France.

In the Signal Corps to-day there are 133,000 men and officers, which exceeds the strength of the regular army when this country entered the war.

Major Oscar Brindley Accident Victim

Dayton, O.—Major Oscar A. Brindley and Colonel Damm, two expert aviators from McCook flying field, Dayton, O., met death as a result of a 400 foot fall, which their machine took while making a turn in the air.

Lieut. Lloyd S. Allen, a member of the Yale Club and the Aero Club of America, was killed in a practice flight when he lost control of his machine and crashed into one of the school buildings of Wilbur Wright Feld, near Dayton.

Rolls-Royce Capital Doubled

London, April 20.—At the annual meeting of Rolls-Royce, Ltd., held recently, it was voted to increase the capital from $950,000 to $1,900,000, subject to the approval of the British Treasury. The new shares are to be issued against a naccumulated reserve of $1,088,000. A cash dividend of 10 per cent for the year, less income tax, was also declared.

S. A. E. to Exhibit Aeroplane Engines at Summer Meeting

Dayton.—Plans have been perfected for the two-day summer meeting of the Society of Automotive Engineers, to be held in Dayton, on June 17th and 18th. The trend of the meetings will be less technical than heretofore, it being deemed more important to lay stress with popular papers dealing with new designs of automotive apparatus for the war.

There will be on exhibition various aviation engines, among which are all of the German types, such as the Mercedes and Benz, Renault, Gnome, Garrone and Hispano-Suiza motors, as well as such British motors as the Rolls-Royce, Sunbeam and others. Several captured German aeroplanes, as well as standard French and British planes will be in evidence.

Among other exhibits of special interest will be demonstrations of machines for manufacturing aeroplane propellers in operation. There will be demonstrations, with explanation, of synchronizing machine guns which fire between the blades of propellers on fighting planes. Formation flying will be executed by various planes, over Triangle Park, where the meetings will be held.

The Engineering Council's War Committee of Technical Societies

Major Henry Abbey, Jr. is Commanding Officer at Chanute Field, Rantoul, Ill.

The War Committee of Technical Societies, of which Mr. David W. Brunton is chairman, was founded by the Engineering Council in July, 1917, and represented at the time of its formation the four founder societies. The Committee was formed for the purpose of stimulating members of the various technical societies into giving consideration to the matter of the invention of war apparatus, with the object of assisting the Army and Navy. As a definite means of effecting this object, the Committee was given the work of procuring problems—especially difficult problems—from the Army and Navy for presentation to the membership of the societies for solution.

For several months the Committee has been coöperating actively with the Naval Consulting Board, and now has offices and a meeting room in the New York office of the Naval Consulting Board, 15 Park Row. The Committee now has the following membership:

American Society of Civil Engineers: Nelson P. Lewis, Major James M. Boyle. American Institute of Electrical Engineers: Harold W. Buck, A. S. McAllister; American Society of Mechanical Engineers: A. M. Greene, Jr., R. N. Inglis. American Institute of Mining Engineers: David W. Brunton, Edmund B. Kirby. American Gas Institute: Dana D. Barnum, F. C. Uhlig. American Electrochemical Society: Joseph Bijur, Dr. Chas. A. Doremus. Illuminating Engineering Society: Louis B. Marks, Preston S. Millar. Mining and Metallurgical Society of America: Christopher R. Corning, George C. Stone. American Society of Refrigerating Engineers: Henry Torrance, F. E. Matthews. American Institute of Chemical Engineers: Charles F. McKenna, Frank E. Dodge. American Chemical Society: (Coöperating) Dr. Chas. Baskerville, W. D. Richardson.

Lieut. Flachaire Flies from New York to Pittsburgh

Pittsburgh, May 5th—Lieutenant Georges Flachaire, the famous French pilot and "ace," flew his Spad machine from Mineola to Pittsburgh. He left Mineola, Long Island, on the afternoon of May 3rd, flying over Bridgeport, New York City, Jersey City, Trenton and Philadelphia, dropping Liberty Loan literature on the way. Stops were made at Harrisburg, Port Royal and Altoona. The last lap of the journey, from Altoona, Pa., to Pittsburgh, was accomplished in very good time, Lieutenant Flachaire leaving Altoona at 4:30 P. M. May 5th, and arriving at Carnegie Institute of Technology aviation field at 6 P. M. of the same day.

Goodyear Dirigible Thrills Ohians

Akron, O.—One of the dirigibles being manufactured for the United States Government by the Goodyear Tire & Rubber Company of Akron, Ohio, flew from that Goodyear Company's field at Akron to Cleveland.

The big airship gracefully manoeuvred over the city at a height of about 500 feet, and dropped aerial bombs on the city, containing Liberty Loan literature, reminding the populace below that only through liberal support of the present third Liberty Loan, thereby providing the means for vigorously prosecuting the war, can we hope to keep our shores free from enemy Zeppelins.

The appearance of the big dirigible was announced by signals similar to those used in English and French cities. Rapid fire guns installed on the Public Square sounded the first alarm, followed by the continuous shrieking steam whistles. The only feature omitted was that of the clanging bells of motor fire apparatus, accompanying the repeated cries of "take cover."

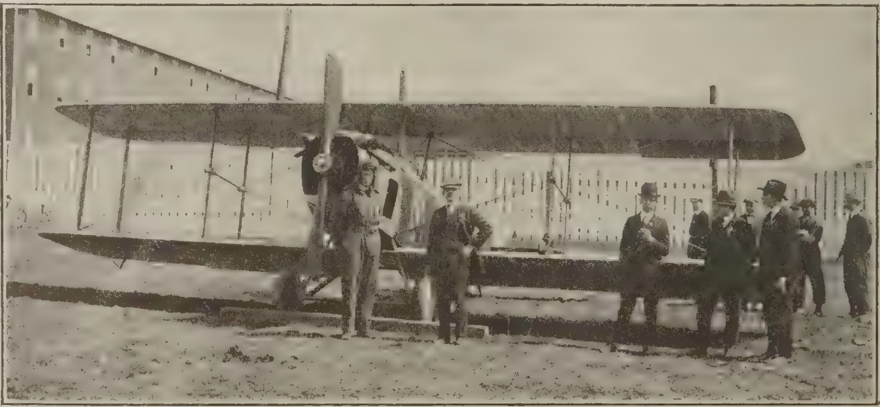
The airship, after performing its mission of furnishing visible evidence of what the government is doing in the way of providing adequate aerial scouting equipment, veered off to the south and in another hour was resting safely, back in its hangar. The entire trip lasted about three hours.

Colors for O. R. T. C. Organization

The following order amending General Orders No. 49 has been issued by the War Department:

Educational institutions, at which units of the Reserve Officers' Training Corps are established, are authorized to provide for the use of such units, colors and standards conforming to those prescribed by Article XXVIII, Army Regulations, 1913, for corresponding units of the Army, except that the seal or insignia of the institution shall be used in lieu of the coat of arms of the United States, and that, on the scroll, in lieu of the inscription prescribed for Army units, there shall be inscribed the name of the institution at which the unit of the Reserve Officers' Training Corps is established.

The provisions of the article referred to will, whenever applicable, govern the use of these colors and standards.



A new Standard speed scout, which flew from the Standard factory at Elizabeth, N. J., to aid the Liberty Loan drive in New York City

Through the efforts of these men (from left to right), H. W. Kavel, Acting director, Dunwoody Institute; W. H. Bovey, President of the Board of Trustees; Lieut. E. A. Hadeen, commanding original aviation detachment at Minneapolis, and W. F. Brooks, President of the Minneapolis Aero Club, one of the largest aviation training schools has been established in Minneapolis

Chanute Field News

Five aeroplanes from the Chanute flying field were used in the campaign for the Third Liberty Loan through the Illinois corn belt on Friday, April 26. The planes were used at the request of the University of Illinois, which supplied the circulars which were used to bomb the towns in central Illinois. After leaving Rantoul, the flyers went to Champaign, then Decatur and then Taylorville, where they made a landing and participated in the big Christian County demonstration.

Girl to Resign from Motor Transport Service

Washington.—Chirstian Girl, having practically completed his duties in Washington as Director of Motor Transport Service for the Quartermaster Corps, is expected to resign in the near future. Mr. Girl came to Washington last fall to take charge of engineering, purchase, procurement and maintenance of the standardized war trucks, and has carried his work to the quantity production stage.

Height at Which Sounds Can Be Heard

In one of his journals, Camille Flammarion gives the heights at which sounds from the earth are heard from balloons. The shout of a man was heart distinctly at the height of 1,600 feet, the sharp note of a mole-cricket at 2,500 feet, and the croaking of frogs in a morass at 3,000 feet. At 3,255 feet a man's voice and the rolling of a cart were distinguished; at 4,550 feet the roll of a drum and the music of an orchestra; at 5,000 the crowing of a cock, the sound of a church bell, and sometimes the shouting of men and women. Nine hundred feet higher still he heard the report of a musket and the barking of a dog. The noise of a railway train penetrated to a height of 8,200 feet, and the whistle of a locomotive engine to nearly 10,000 feet.

The Aero Club of the Northwest

For the purpose of disseminating information concerning aviation throughout the Northwest, the Aero Club of the Northwest has established quarters at 405 University Street, Seattle, Washington. A library will be maintained for the free use of the public, where there will be kept on file the leading French, English, and American magazines dealing with the latest developments in aviation. Information will also be on file for those desiring to enter the aviation corps of either the army or the navy. People throughout this section of the country are urged to make use of this opportunity.

Alderman Collins Joins the Aviation Corps

William T. Collins, Tammany Alderman from the Twelfth Aldermanic District, who waived his right to exemption from the draft act, enlisted recently in the Aviation Corps. Collins had a right to exemption because he held an elective office, but he asked permission to join the Aviation Corps. Inasmuch as he is over thirty years old, he was required to get special permission from the Signal Corps in Washington. Until called to service he will train under Capt. George Morris, of Company F of the Seventy-first Regiment, N. Y. G.

Alderman Collins will not resign his seat in the Board, as he announced last week he planned to do. He has found that he can remain a member until the expiration of his term on December 31, 1919. This will put an end to the plan of his fellow members to name his wife to the Board to fill the vacancy which her husband's resignation would have caused.

Official List of American Aces

PARIS, April 27.—The standing of American aviators based on the number of adversaries shot down to date follows:

Major Raoul Lufbery, 18; Major William Thaw, 5; Lieutenant Frank Baer, 5; Sergeant Baylies, 5; Captain Charles Biddle, 2 and Sergeant Vernon Booth, Sergeant August Grebore, Second Lieutenant Henry Grendelass, Sergeant Thomas Hitchcock, Jr. (now a prisoner); Lieutenant Friest Larner, Sergeant David Putnam, Sergeant W. A. Wellman, Lieutenant Allan Winslow and Lieutenant Douglas Campbell, one each.

Gerard Urges Aerial Offensive

In an address at the dedication of the Y. M. C. A. Liberty hut at Washington, D. C., April 27th, ex-Ambassador James W. Gerard, formerly Ambassador to Germany, urged that countless American aeroplanes drop bombs over Germany until the German people realize that the great war menaces them as well as all the rest of mankind.

The appointment by the President of Charles M. Schwab as head of the shipping board and John D. Ryan in charge of the aircraft program was commended by Mr. Gerard, and he urged the adoption of the Overman bill, giving full power to the President.

At the Army Aviation Schools

Lieutenant J. B. Buchanan and Lieutenant Russell Bandy were slightly injured at Clinton, Ill., recently when their aeroplane crashed into a freight train. They are fliers from Chanute Field, Rantoul, and had been ditributing Liberty Loan literature. While passing over Clinton their rudder became unmangeable.

Major John Purroy Mitchel, former Mayor of New York has qualified as a reserve military aviator at San Diego, having performed the necessary altitude and evolutions for that rating.

Manager Bowman and Instructor Meyerhoffer, who have charge of the Riverside Aircraft Company's school of Riverside, Cal.

According to Walter Camp, Commissioner of Athletics for the Navy, David J. Yales, of New York City, will soon be appointed Director of Athletics at the Pensacola, Fla., Naval Air Station.

With Our Boys "Over There"

Lieut. G. De Forrest Larner, an American aviator, has brought down his second German aeroplane.

Flying alone he attacked the German machine, killed the observer and shot the machine down in flames, killing the pilot, according to word which has reached Washington. The action took place in the Oise River area where he was flying with the French armies on March 25. His first German machine was brought down March 18.

An American naval lieutenant took part in the air raid against the German submarine base at Zeebrugge on the Belgian coast.

The American narrowly escaped from German gunfire and German aeroplanes while bombing hostile aeroplanes and the mole in the Zeebrugge harbor.

Lieutenant Paul Frank Baer, now of the United States Flying Corps and formerly of the Lafayette Escadrille, was honored by a citation which appeared in the *Official Journal* of May 2nd. The citation follows:

"Paul Frank Baer, Lieutenant of the American Lafayette Escadrille, an American pilot engaged in the French Army, has shown himself at once a pilot of the first rank, engaging the enemy in numerous combats, in which he has always put the enemy to flight, and has downed an enemy aeroplane."

A German aeroplane was brought down in enemy territory by Capt. James Norman Hall of Colfax, Ia., and Lieut. Edward V. Rickenbacher of Columbus, O., after a battle over the American line on the Toul sector.

Italian Flier Covers 145 Miles in One Hour On Liberty Day

Washington, May 3rd—Sergt. Gino of the Italian Flying Corps, startled the people of Washington by unexpectedly appearing in the air over the parade viewing crowds who were thronging the sidewalks witnessing the Liberty Loan parade. Swiftly darting low down through the air, doing "stunts" of a breath taking character. He had just arrived from Langley Field, Virginia, covering the distance of 145 miles in one hour, that being a record for such a flight. The other day this speed wonder made the round trip between Washington and Baltimore, a distance of 74 miles in half an hour.

Woman's Naval Service Holds Dance at Plaza for Aviators

New York, May 1—Several hundred persons attended the dinner and dance, held under the auspices of the Woman's Naval Service, at Hotel Plaza, New York City, on May 4th. Mr. Henry A. Wise Wood, of the Aero Club of America, made an address of welcome, following which there was an hour of music. The income from the benefit will be devoted to purchasing athletic outfits for aviators at the camps in France.

H. P. Whitney's Son Wins Aviator's Commission

Fort Worth, Tex.—Cornelius Vanderbilt Whitney, son of Mr. and Mrs. Harry Payne Whitney of New York and great-grandson of Commodore Vanderbilt, was commissioned a Second Lietenant in the flying section of the Signal Corps on April 25th and assigned to duty at Benbrook. He has been in training for four months.

The AIRCRAFT TRADE REVIEW

N. E. J.

Wright-Martin Buys Long Island City Factory

The Wright-Martin Aircraft Corporation, which has been manufacturing Hispano-Suiza aviation motors for the French Governmen. at New Brunswick, N. J., has purchased the huge plant of the General Vehicle Company, in Long Island City, N. Y. This plant will be devoted to the manufacture of the famous Hispano-Suiza motor for the United States Government, which has placed an order for a large number of 300 horsepower motors. The plant, when worked to full capacity, requires a working force of from 6,000 to 8,000 men.

Aeroplane Mechanics' School in Detroit

Detroit, Mich.—The Michigan State Auto School of Woodward Ave., Detroit, Mich., has opened an aeroplane mechanics' course in order to train men as aviation mechanics or as production men for the aeroplane engine factories.

The course requires two months, and includes assembly, repair and operation of aeroplane engines, as well as construction and maintenance of the machine. The apparatus used for the work so far is confined to production of the Curtiss plant, including a Curtiss Model J.N.4. Students are given practical work, such as overhauling and rebuilding machines, which have been in service. One of the machines which has been repaired had been badly damaged by a nose dive, and the repair of this machine gave the students ample practice. A Roberts six-cylinder motor, which was the power plant of this plane, has also been repaired and put in running shape by the students.

The head of the aeroplane instruction faculty is a Curtiss expert. The school plans not only to turn out mechanics for war purposes, but to establish itself for the demand that will exist after the war.

Victor Talking Machine Company Gets Hydroaeroplane Contract from the Navy

Washington, April 22nd.—The Victor Talking Machine Co., of Camden, N. J., has received a government contract for hydroaeroplanes for the navy. Five thousand employees are to be engaged in the work.

Rubber Imports May Be Curtailed

Washington.—According to reliable information, the War Trade Board is about to issue an order which is intended to curtail the importation of raw rubber to this country. It is designed to create more available shipping tonnage for traffic between this country and France.

This curtailment will greatly effect the rubber tire industries, whose increasing demands have required 400 per cent. greater imports in the last five years.

It is understood that the order will refuse licenses to importers of the better grades of rubber from Java and the Far East.

Rubber imports from South America will be continued, but these will be insufficient, and it is anticipated that after the reserve rubber stocks in this country are exhausted, American tire manufacturers will be forced to produce tires of less durable material.

A Correction

It has been called to our attention that in our issue of December 31st, 1917, we stated that the "Triplex combination," referring to glass for aviators' goggles was "known as Resistal" in America and was manufactured by Strauss & Buegeleisen. This statement is not in exact accord with the facts. "Triplex" is a copyrighted trade-mark, the process used in the making of the glass is secret, and this process is covered by the Triplex-Mascart-Benedictus patents, the sole rights of which are owned in this country by the Triplex Safety Glass Corporation of America. This company is affiliated with the Societe de Verre Triplex, 13 rue des Nouettes, Paris, France, and the Triplex Safety Glass Company, 1 Albemarle Street, Piccadilly, London, England.

The Triplex Safety Glass Corporation is erecting a building 150 x 200 at Mount Vernon, New York, especially adapted for the manufacture of Triplex and designed by the English Triplex management. The American Triplex company will manufacture Triplex exactly as it is manufactured by the French and English Triplex companies and will be producing glass in two months.

Mr. Rowland Barbour, production manager, and Mr. W. J. Finlay, sales manager, have spent six months in the French and English factories, and so as to insure proper manufacture of Triplex, this company is utilizing the resources of the English and French Triplex companies both as to machinery and heads of departments, who are already in this country equipping the factory.

The Triplex Safety Glass Corporation has the backing of influential business men, the directorate being as follows: Messrs. W. E. S. Griswold, H. P. Teare, W. B. Ticknor, Charles W. Pruyn, J. W. R. Crawford, president; W. J. Finley, vice-president.

Aeroplane Tires

Uncle Sam, already the largest consumer of rubber tires, is now entering a new field that will augment his tire bills to even greater proportions. A new demand will arise from the adoption of the aeroplane as a carrier of United States mail.

Aeroplane tires have been manufactured by the B. F. Goodrich Rubber Company for over ten years. Glenn H. Curtiss was the first aeroplane manufacturer to adopt the pneumatic tire on a substantial scale. Wright Bros. used skids in their first experiments, and were slow to see the practicability of rubber tires. The plane in which Curtiss made his first long flight, the one over Lake Erie, was equipped with Goodrich aeroplane tires. Tires used in aviation evolved from the bicycle tire. The first tires used by Curtiss at Hammondsport, N. Y., were bicycle tires.

Tires such as will be used on the postal planes are of special construction and differ in many respects from automobile tires. Aeroplane tires are built upon the principle of least weight with the greatest strength—they must lend great speed in starting, have exceptional strength to withstand hard, direct blows and side shocks in landing, and must be unusually resilient in order to absorb shocks evenly. Aeroplane tires have no thick tread and have no breaker strip, two essential features of auto tires. Rubber of exceptional quality is used in the side wall and tread, giving maximum flexibility.

The Modern Fiat Engine Test Shop

The Fiat Company, of Torino, Italy, which is constructing a large proportion of the aircraft motors used by the Italian Government, submits its motors to the most exacting tests before they are put into service. For this purpose, a very modern and efficient testing shop has been erected. The test benches are arranged in parallel rows and series of twelve, each bench being independent and arranged on an armoured concrete foundation with a bank of sand around it to absorb vibration. The exhausts discharge into a large underground concrete main, which is provided with a powerful exhaust fan. Not only does this arrangement render the shop free of disagreeable odors, but the noise of the motors is thereby greatly reduced. The fuel is contained in underground tanks and is connected to the carburetor by means of flexible tubing.

The new, enlarged Glenn L. Martin Aircraft factory, in Cleveland, is now practically ready for occupancy

750 h.p. Sunbeam

Not content with having advanced the Sunbeam-Coatalen engine from 150 h.p. to 500 h.p. maximum the manufacturers are now experimenting with the object of producing engines of 750 h.p. on a weight basis not exceeding 2.5 lbs. per h.p. The attempt may be expected to elicit the familiar arguments respecting the comparative advantages and disadvantages of using one big motor, or of relying upon two or more for the same totality of power. It is a tribute of merit, as well as an objection, that high efficiency engines need high efficiency engineers to put them together, and that they are only possible of manufacture when the very best materials are available.

Estimate of Transport Cost

M. Soreau, vice-president of the French Aero Club, has struck out into original calculations, the result being that he differs from the formulæ usually accepted as the cost of aerial transport. Usually it is assumed that a big machine, by reason of the larger quantity of goods or mail carried, will perform the work more cheaply than a small machine will. M. Soreau fails to follow that assumption. He stated that a special type of two-seater of 2,170 kilos could carry over the Paris-London route 400 kilos of letters. That part of the matter seems simple. Then he calculates that a smaller machine of 1,440 kilos could carry 280 kilos, the lesser weight carried being more than offset by the saving in expenses. As his scale of calculations is not at hand one cannot verify the items. It amounts to this, that the smaller machine could carry 3,080 kilos of letters compared with 2,800 carried at the same cost by the larger machine. His paper was read at a meeting of the French Academy of Sciences, and the meeting also discussed projects of aerial postal communication with Asia and Africa after the war.

Triplex

A finely illustrated booklet on the merit of "Triplex" has just been issued by the Triplex Safety Glass Company, Ltd., 1 Albemarle Street, W. From this publication we gather that the manufacture of glass was first discovered by the Phœnicians in Palestine about the year 700 B. C., and improved by the Assyrians. The Romans made great headway with glassware, but it was not until the 20th Century that unbreakable glass was invented. Triplex glass is both transparent and fracture proof. It is claimed to be non-shattering, non-splintering and, in short, the ideal glass for motorists, airmen and those requiring protection from danger.

International Air Traffic Company

According to the *Neue Freie Presse,* January 4, a new company has been formed in Austria-Hungary styled the International Air Traffic Company (Internationale Luftverkehr - Aktiengesellschaft, abbreviated "Ilag"). It is intended that the "Ilag" shall at first undertake the conveyance of letters and parcels on the route Hamburg - Berlin - Dresden - Vienna - Budapest - Belgrade-Sofia-Constantinople. From points in this main line numerous branch lines will run to the most important cities and traffic centers of Germany and Austria-Hungary, so that, according to present intentions, the whole of Central Europe will be covered, at no very distant date, with a close network of air lines. Passengers will be carried as well as postal matter.

Steps are to be taken to form separate companies in Austria and Hungary. The promoters are in touch with interests in Germany, so that there, too, a company will shortly be formed in close connection with the Austrian and Hungarian enterprises. The Austrian and Hungarian post-office administration, even before the war, had begun negotiations for a contract for postal dispatch, which can only be definitely concluded when the "Ilag" is ready to commence its service; negotiations, however, with municipal authorities have already commenced there with a view to providing landing places suitably equipped in all the towns covered by the new air service.

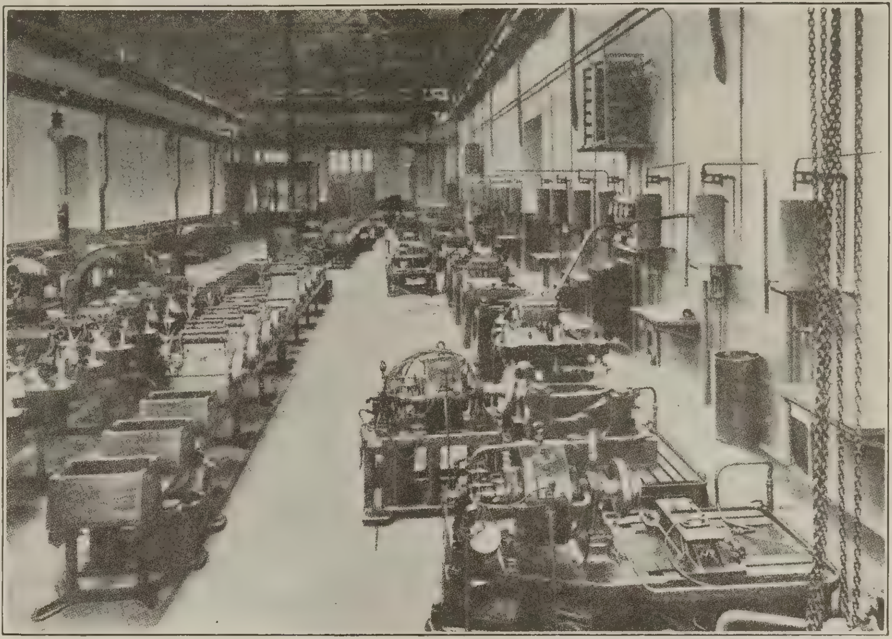
Meanwhile the legal committee of the Hungarian Aero Association has made an agreement with the Austrian Aero Club and the Imperial German Aero Club of Berlin that the contemplated interassociation conference for the purpose of establishing uniform laws for the air, to which those in Bulgaria, Turkey and Poland interested in the matter, are to be invited, shall take place in Budapest in the second half of 1918.

Personal Pars

L. R. Scafe, for two and a half years secretary and treasurer of the Saxon Motor Car Co., has been appointed comptroller of the Dayton-Wright Aeroplane Co., Dayton, Ohio.

Howard Taylor, who for some years has been chief electrical and mechanical engineer of the Spanish River Pulp and Paper Co.'s plants, with headquarters at the Soo, has resigned to become consulting engineer with the Dayton-Wright Aeroplane Co., at Dayton, O.

Rodney Chase, now in the naval aviation service, is engaged to Miss Grace P. Hendricks, of New York City. Mr. Chase was a member of the Yale class of 1920 before his enlistment.



The modern testing plant of the Fiat Company. The exhaust gases and fuel supply are conducted by underground piping

ALL BRITISH FLYERS IN ROYAL AIR FORCE

ALL officers of the British Royal Naval Air Service and Royal Flying Corps will be granted temporary commissions in the Royal Air Force, according to an order recently published in the official London *Gazette.* Another order provides that for the duration of the war khaki will be worn as service dress. The orders are as follows:

All officers serving with the Royal Naval Air Service and Royal Flying Corps on the 31st March, 1918, or in connection with those services in certain Government departments, in other than the undermentioned capacities, are granted temporary commissions in the Royal Air Force, with effect from the 1st April, 1918, in ranks which will appear in the Royal Air Force list.

In view of the special circumstances incident to the inception of the Royal Air Force these ranks must be regarded as subject to revision as circumstances may require until confirmed by the actual issue of the Commission.

The exceptions are as follows:

Certain officers of the Royal Navy whose services are only lent temporarily to the Royal Air Force.

Certain accountant officers, Royal Navy.

Officers under instruction, other than those holding commissions or appointments in the Royal Flying Corps.

Officers in charge messing, other than those holding commissions or appointments in the Royal Flying Corps.

Officers serving with cadet units, other than those holding commissions or appointments in the Royal Flying Corps.

Liaison officers, other than those holding commissions or appointments in the Royal Flying Corps.

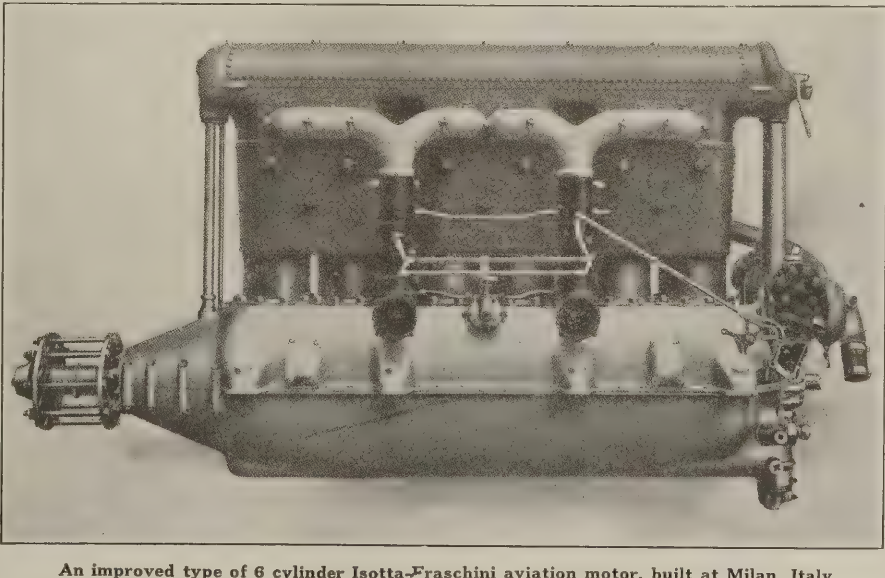
Medical officers and chaplains.

Quartermasters, other than those holding commissions or appointments in the Royal Flying Corps.

BLUE UNIFORM TO BE USED

For the period of the war khaki will be worn as service dress; after the war uniform of the same pattern, but of light blue cloth, will be substituted as early as possible. The blue uniform (but this is optional) can be worn by officers during the war as mess kit. The new uniform will not be made compulsory until sufficient time has elapsed for existing uniforms of the R. N. A. S. and R. F. C. to be worn out,

(*Continued on page* 463)



An improved type of 6 cylinder Isotta-Fraschini aviation motor, built at Milan, Italy

THE USE OF JIGS, FIXTURES, GAUGES AND TOOLS IN AEROPLANE MANUFACTURE

(*Continued from page* 418)

Drilling Jigs

Much greater accuracy could be secured by making the guide bushes for the drills of proper length, relative to the size of the drill. At present many drilling jigs do little more than serve to indicate the position of the holes—there is insufficient bearing to take care of the truth of the drilling.

Limits

As in the case of metal working, absolute accuracy in woodworking is not only impossible, but also unnecessary. Hence, maximum and minimum limits are required for all dimensions in aeroplane work. These limits are naturally much wider than those essential for metal work. For both holes they are usually of the order of plus or minus 0.01 inch. For lengths of under three feet the allowance is normally plus or minus 0.03 inch; for longer pieces the allowance is increased 0.01 per foot; due discretion being exercised according to the circumstances, *e.g.*, on aileron hinge joints of, say, eight feet or so, it would not be more than 0.04 to 0.05 inch, with present day designs. However, hinge design is a matter that should receive more attention. There is a tendency for spars to warp across the grain if exposed to bad weather conditions, hence a limit of 0.05 inch is usually provided to counteract these atmospheric effects.

When seasoned wood has been milled it should be laid aside for about ten days and then drilled by jig before the fittings are assembled. It will then be found that no trouble will be experienced when the parts are fitted together, as there will be no appreciable shrinkage under these conditions.

Board Jigs

Small pieces are generally put together to form components on a board jig. This consists of a board on which small positioned pieces of wood (or in some cases metal) and locking turn buttons are fixed in such a way that a piece of wood placed round the outside or inside will assume the required curve. If these boards were built up on some sort of box frame, or series of small boxes, and the ordinate length stops fixed to sliding pieces, these boards could be turned out in quantities and merely adjusted to the various ribs. This would save considerable time in setting up the board and when a particular rib was finished the board would not be scrap, but could be readjusted to fresh parts.

In the case of board jigs for holding pieces together when glued, the curve must be cut from a board so as to give contact along the whole outside member. Clamping cams, or turn buttons, for board jigs, should be standardized and turned out in quantities so that they can be supplied from stock. These cams should be designed so that they will give a grip that is not too sudden. One of the best designs is that of an eccentric "comma."

Unit Assembly Jigs

The wings, tail planes, etc., should be fitted together in a jig, so designed, that both sides can be worked on and in such a way that it is impossible to assemble a portion in the wrong manner. For glueing operations a number of similar jigs are often required, so that sufficient time may be allowed for the glue to set, without holding up the workpeople. Glued portions should be clamped together until set. On large assembly jigs the design of suitable clamping devices affords exercise for much ingenuity.

A matter that is often overlooked in aeroplane erection is the necessity for cramping together, under considerable pressure, all members which have been cut across the grain in the process of manufacture. The reason for this is, that however well set the saw may be, it always leaves a soft fibrous mass at the end of a piece of wood when cross cutting it. Heavy pressure will bed the ends of sawn members together. In the case of aeroplanes, which are assembled without proper cramping arrangements, it is found that all the tie wires become slack after one or two landings. This is undoubtedly due to the giving of the unbedded ends of the various members.

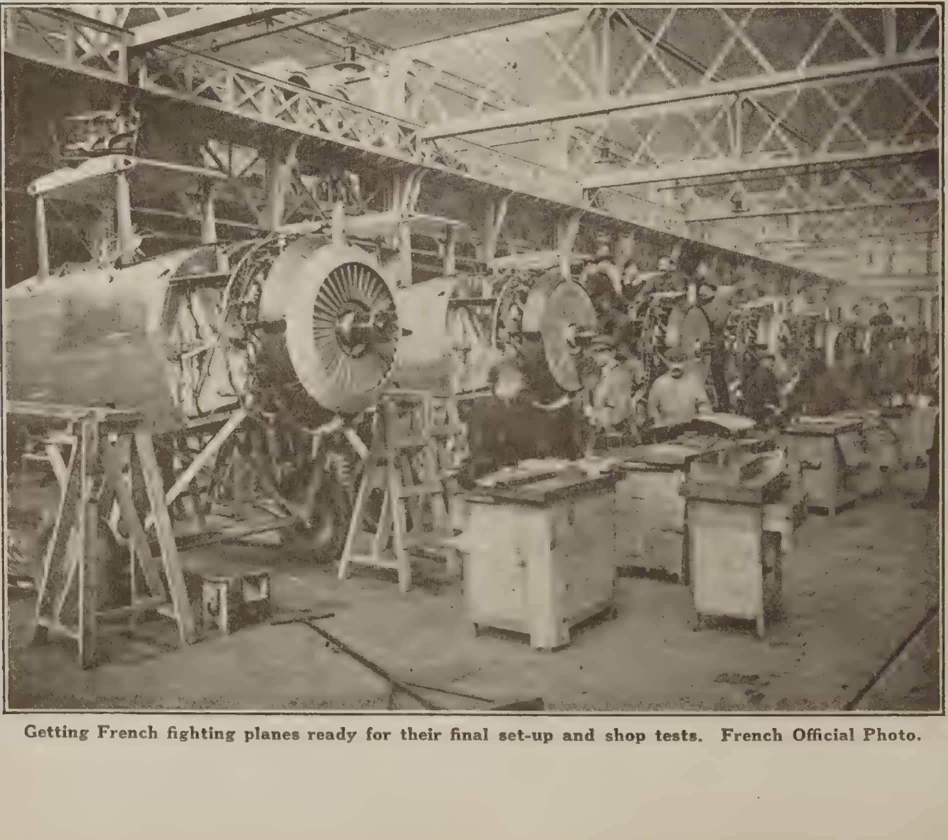
Jigs should be so designed, as a rule, that no operation on them will require more than say two hours' work at a time. Such an arrangement greatly facilitates the passage of work through the shops.

A fixture is in use in several works in which the wings are placed with the correct incidence and dihedral angles. The wires are then strained so that the leading edge assumes such a position relative to a fixed point on the jig that the wing takes up its correct form. The wings are then sent for covering and doping, and it is found that they very seldom require any adjustment when fitting to fuselage. This of course means that wings can be made in quantities and stored, to be withdrawn as required, whether as spares or for fitting to new machines. Some such jigs should be used in the final erection of wings on a machine to ensure that they take up their correct position. To speed up the work a tautness meter may well be used for rapidly testing the straining of the wires.

In one type of fixture, the rear portion of the fuselage is fixed on a sliding table, to have the rudder post fitted dead square and central. There are also guides so that the four front ends of the longerons may be cut off square relatively to the rudder post and to the correct length. The rear portion is then a complete unit, ready to be fixed to the rest of the machine without any further fitting. This is a most desirable fixture and should be used whenever applicable. In the case of large machines the sliding tables should be on the floor level so as to make the job easily accessible.

Erection Fixtures

The whole machine (not necessarily always including the wings and chassis) should be finally erected in a specially constructed fixture. This usually consists of a large surface plate or a concrete

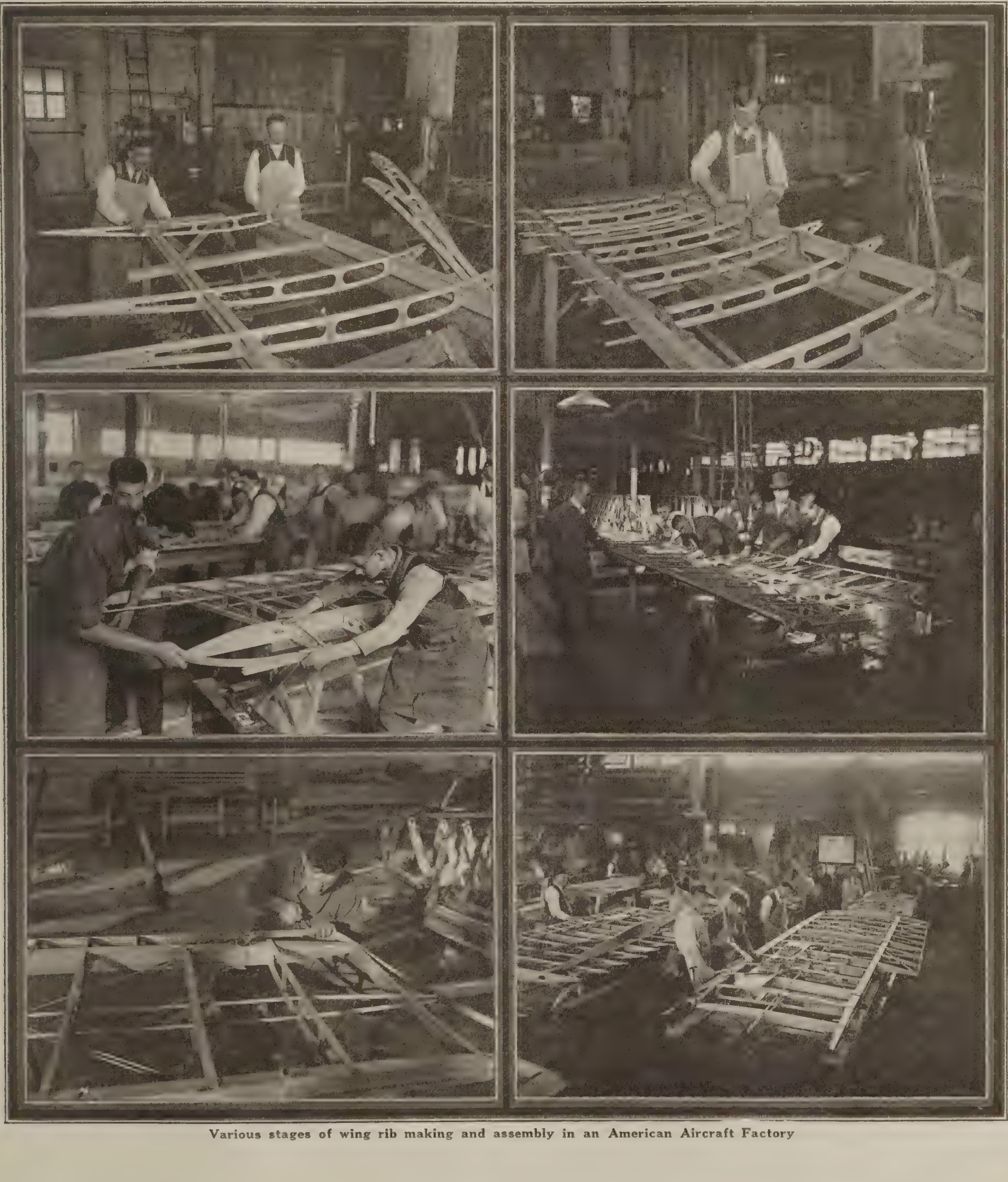

Getting French fighting planes ready for their final set-up and shop tests. French Official Photo.

foundation, with brackets fixed so that the various units must come into their correct relative positions. Less reliable forms consist of timber structures.

In Conclusion

There seems to be no doubt but that for even the building of a small number of aeroplanes, considerable use should be made of both part and component jigs. If the number is in the neighborhood of 50 or so, the utilization of quite a number of unit jigs will be advisable, while for anything over 250 machines, jigging can be carried to a considerable extent with great advantage, including more or less elaborate erection fixtures. In fact the only risk in thorough jigging may be said to be in the case of erection fixtures, owing to changes in aeroplane design. However, even these appliances can be designed upon an adjustable basis.

Reference has been made earlier in this paper to the need of organized design along modern scientific lines. Such methods benefit the worker in enabling him to earn higher wages with less strain, while at the same time it is advantageous to the employer. In this consideration a third great party had been overlooked—the whole nation—the consumers, who purchase the product of the first two, and who ultimately pay both the wages of the workpeople and the profit of the employers. A brief scrutiny of industrial history indicates that finally the whole nation gets the greater portion of the benefit coming from industrial improvement. To this end, therefore, any progress in the development and application that may be made in this connection, must be to the ultimate benefit of the people as a whole—even if it appear to be but a side line in industrial work. At the present moment economy in man



Various stages of wing rib making and assembly in an American Aircraft Factory

Putting the final touches to a French fighting plane. Women are doing very important work in this connection in England and France

accelerate the output of such important war material as aeroplanes should be given very careful consideration, even if it involves such a disturbing effort as the direction of thought along unaccustomed lines.

Such then is the case for the more extended application of the use of jigs and fixtures in the manufacture of aeroplanes.

Expressions of Opinion

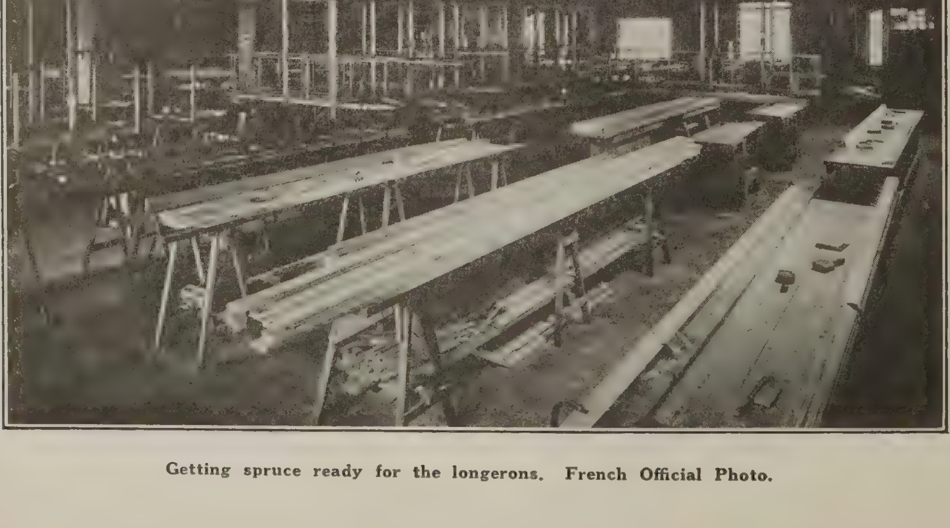
Lieutenant-Colonel Sir Henry Fowler, K.B.E., Assistant Director General of Aircraft Production to the Ministry of Munitions, occupied the chair.

Lieutenant A. R. Low, R. N. V. R., who opened the discussion, by permission of the Superintendent of the Drawing Office, he showed slides depicting the processes of seaplane boat building by the aid of jigs.

Mr. H. R. Hollis showed a slide giving an idea of the method of final erection. This had been slightly accentuated in the United States by the adoption of so-called erection jacks, which made the final erection much easier and obviated the use of plumb lines and temporarily rigged means of locating the various points. The erection jig illustrated had been used with much success by the Curtiss Company and had reduced labor by some fifty man-hours per machine, and so increased the output. These jigs accelerated the production of aeroplanes by 75 per cent, and the straining of landing and flying wires had been reduced more to a science than hitherto by the use of tension gauges. He thought the system shown might with advantage be adopted by more manufacturers in this country. The particular jig illustrated was made from gas piping, and called for no great accuracy, because the trays which carried the wings were adjustable. The total cost of the jig was about something under £100. Its U. S. number was Curtiss DX. The saving of labor on one machine more than paid for its share of the cost of the whole jig.

Captain Outram, R. F. C., said, as an inspector, he supposed he would be expected to be prejudiced in favor of the most elaborate jigging possible, because most certainly the more jigging that was done, the easier the inspector's job. The jigs made in different works on much the same lines differed considerably in detail construction, and often in dimensions, and did not take into account the fact that certain tolerances had to be allowed on the detailed parts. That was an argument in favor of Mr. Borlase Matthews's proposal that drawings of these jigs should be considered as carefully as the drawings of the parts. The jigs being designed with various clamps, there was a great tendency to spring the parts into place and the finished part had sometimes lost truth owing to that.

With regard to the necessity for the checking of jigs, jigs were frequently made of soft wood, and the result was a considerable amount of wear and of moving and warping of the jig, and they required constant checking to maintain them in truth. In one case he could not understand why certain ribs came out different from the drawings, and he found that a man had made a part wrongly and another workman had altered the jig to suit the wrong part. There seemed to be an impression that if a complete component were made in a jig it would be correct in its finished state. That was a fallacy. If a wing were got correctly out of the jig, and covered badly, with too big a strain on it, it was pulled out of truth at once. One had to be very careful, therefore, in deciding at what stage to jig and in watching the effect. He had known elaborate jigs to be made which did not locate the important points of the component. A case occurred recently where with an accurate jig for the fuselage, no attempt was made to locate the fittings for attaching the wings. The fuselage was true, but the wings were out of truth. That pointed to Mr. Borlase Matthews's proposal that the jigs should be carefully designed by a special drawing office. In the majority of cases jigs had to be made up, and one could sometimes make the part he required more quickly than



Getting spruce ready for the longerons. French Official Photo.

he could obtain certain material for the jig. In the design of jigs he thought only the essential parts should be shown, the details being left to the man who made the jig.

Lieutenant Mann, R. F. C., said the main difficulty they had encountered in checking jigs of a large size was the shortage of accurate measuring appliances. They had experimented with steel rules and tapes, but found them unsatisfactory for gauge and jig making. They set to work to get out a cheap form of gauge, so that they could be loaned to contractors to check their workshop gauges. He showed on the screen the first attempt, which consisted of piano wire stretched from end to end of a frame with discs sweated into position upon the wires. He next showed the present form of gauge, which consisted of a timber frame of cruciform section having sheet metal ends, between which the gauging wire was strained. This frame would carry any one of the gauges, the total of which formed the set for the machine. The wire was ¼ in. diameter high tensile steel, and the discs were made on a capstan lathe and faced up in a precision lathe, and were slipped on to the wire and sweated up into position. He next showed an appliance they were adopting for assisting in eliminating the complete erection of machines. Doing away with any work increased production, and by avoiding the erection of wings they saved floor space which could be used for other purposes. There had been a lot of difference of opinion as to limits and what clearances were necessary. He showed a table giving information in regard to these matters, and to hinges used in various components.

A French reconnaissance machine being tuned up before leaving the factory for field tests.

Captain S. W. Hiscocks, R.F.C., said if a machine had to be turned out in a week it was impossible to make all the parts to jig. The fault in some of the jigs that had been shown seemed to be due to the original design of the machines. The jigs seemed too elaborate considering the cost of the parts involved. His experience was that the majority of those who had gone into the aeroplane designing business had not the faintest idea how the parts were made or assembled, though there were a few exceptions. There was no need to have a machine for making struts. It could be done on an ordinary spindle.

He would say further that the question of the number of jigs that could be made for production purposes did not depend so much on the production side as upon the people who were responsible for getting out the designs and placing orders for machines.

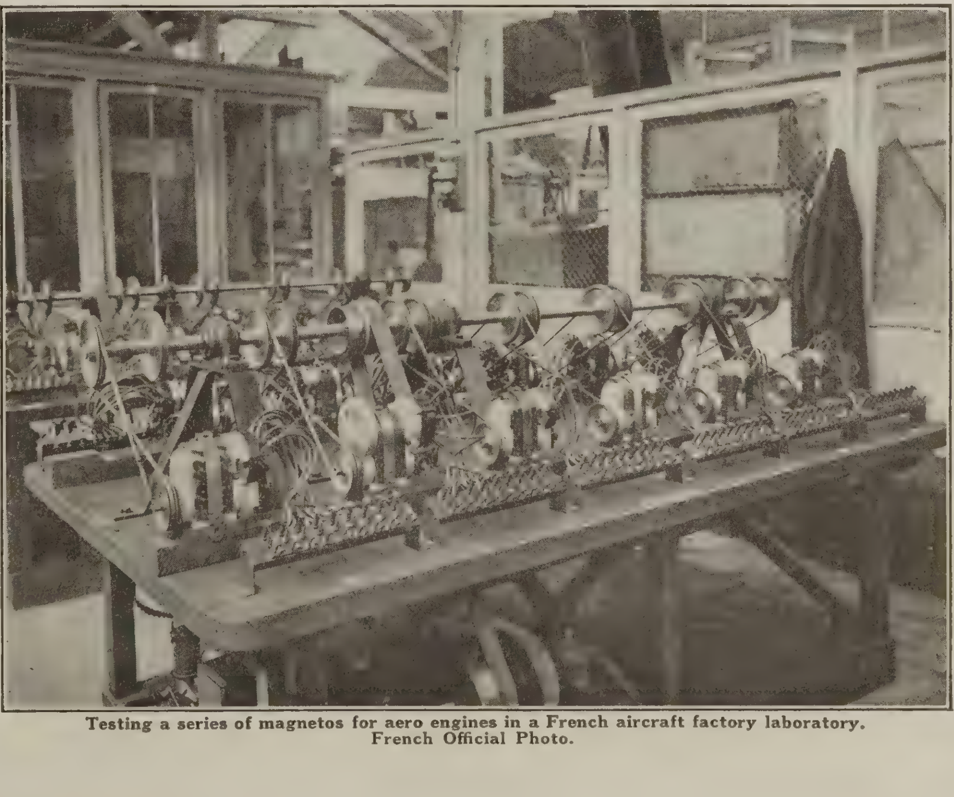
In many cases the manufacturers are asked to start delivering machines before the drawings are completed, and to do this a large number of parts have to be made by hand from rough sketches, so as to get the production going during the time required to make the necessary tools and jigs for producing parts.

If the country wants cheap production of aeroplanes, it will be necessary to allow some two or three months between the completion of the design and the delivery of the first aeroplane to that design, to enable the manufacturers to lay the work out properly.

Another difficulty in connection with arranging for the use of jigs is that the design of a number of the parts is such that cheap production and assembly by use of simple jigs is impossible, especially so as many of the drawings do not include the necessary limits to ensure interchangeability.

This, he thought, was due to the fact that the aeronautical industry, from a manufacturing point of view, was only about three years old, and that the draughtsmen who prepared the drawings had not had shop experience in the manufacture of aeroplanes.

As an example of the above, one of the photographs shown by the lecturer illustrated a strut copying lathe, which to his mind was an unnecessary machine, as it was quite easy to design struts so that they could be finished, with the exception of cutting to length, direct from the ordinary common spindle, thus cutting out the use of an expensive machine and saving time in production.


Testing a series of magnetos for aero engines in a French aircraft factory laboratory. French Official Photo.

An interesting type of aircraft factory building. The "jobbing" room in a French factory, where work of a general nature is done. French Official Photo.

Mr. H. Pearman said it was the same now as in the early motor car days as regarded the deplorable difference in the amount a firm would spend on plant and that which they would spend on so-called non-productive equipment, and the result was inefficient production. The lecturer's suggestion with regard to the centralization of jig and tool fixture design was a good one, particularly in view of the control manufacturers were now under. Manufacturers would appreciate the establishing of the principles of the design in a central office, and they would be broad-minded enough to accept such designs in a proper spirit, and greater efficiency would result. A person spending £500 on a machine should be willing to spend £20 on equipment.

Mr. F. Handley Page said he thought the Services required a little tuition, and not the manufacturers only. There could not be standardization of production unless there were unity of demand. Large numbers of machines could not be turned out if changes were made every week. There was a great difference between manufacturing for a Service and manufacturing for a public. In the latter case the public could be persuaded that they wanted what one had to offer, and then thousands or hundreds of thousands of the article could be produced, but it was difficult to persuade a Service, who interrupted the manufacturer frequently with fresh modifications. It was therefore to the Service side that an appeal for unity of demand had to be made. Mr. Borlase Matthews said there were very few jig and tool drawings in this country. He thought the country was hardly so uncivilized as that would indicate. He thought in all decent works there were as many jig and tool drawing offices as ordinary drawing offices. In the case of larger machines than those shown on the slides the question of dividing the machine into units which could be easily assembled separately was of vital importance. It was impossible to have a machine with 100 ft. planes completely erected. In the case of his works the planes and other large parts were assembled separately from the machine. He would like to ask Mr. Borlase Matthews whether it was practicable to erect all one's planes in a vertical position, instead of the horizontal method of assembly? Had any manufacturers experience of assembling planes in this way?

Captain Bishop, R.F.C., said he agreed that the drawings of jigs and fixtures should have more time devoted to them than they had. He remembered one case where contractors complained that the tolerances were too small. New drawings were got out giving exceptionally large tolerances. The contractors then complained that they were too large, as parts made to them would not fit their jigs. Where jigs were instituted higher precision work had to be instituted in the preceding operations. With a long run of production erection jigs were worth making, but his people once laid out a jig on those lines, and by the time the jig materialized the aeroplane was finished. Most gauges required a certain tolerance, and that, as well as the tolerance for the parts, should be allowed for in dimensioning up the various machines.

Mr. Davidson said if jigs were designed at the time the machine was being aero-dynamically considered it would be easier for the manufacturer, as alterations and modifications would not come through in the present quantities, and they would be checked when the jigs were being got out. The limits of interchangeability would have to be considered also, so that several matters could be settled at one time. If there were a central office for designing jigs, and the best way of making a certain part were discovered, that way would be standardized and everybody would not have to make experiments.

Mr. Pettit said a vital matter to consider was the getting of a big output of machines. Mr. Matthews was rather unfortunate in the choice of one slide which showed a fuselage building jig, and in which the longerons were located by blocks placed inside the longerons and the cramping devices came on the outside, the result being that the compression would be up against the wood block rather than

(Continued on page 467)

A section of one of the wood-working rooms in a French factory. French Official Photo.

THE ALBATROS TYPE "CV" FIGHTER

(*Continued from page 261*)

THE cockpits of the Albatros are arranged in the fashion now universally adopted for two seaters, by Allies as well as by the enemy, i.e., the pilot in front and the gunner in the rear cockpit. The pilot's seat is mounted, in the Albatros, on the main fuel tank, which has two annexes on top, one on each side of the seat. This arrangement is clearly indicated in Fig. 12, in which the small clips preventing the seat from sliding about on the tank will be noticed. The filler cap is mounted on a tubular projection extending through the fuselage covering, thus enabling the tank to be refilled from the outside. A smaller auxiliary tank is mounted above and to the rear of the main tank, in the gunner's cockpit, as a matter of fact. Both tanks are connected up to a by-pass or distributor, so that both or either tank can be connected up to the engine, two pumps being provided for maintaining the necessary pressure, one driven by the engine and the other hand operated. Thus, whatever tank is being used, petrol is fed to the carburetor under pressure. This has probably been a necessary provision, as the tanks are placed relatively low and gravity feed would, therefore, be apt to be unreliable when the machine is climbing at a fairly steep angle.

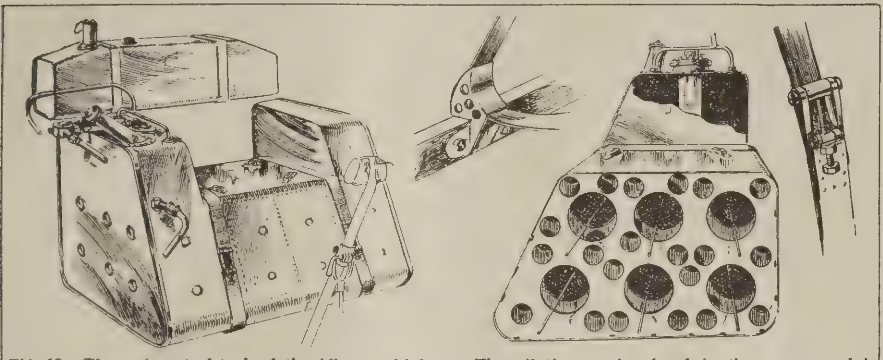


Fig. 12.—The main petrol tank of the Albatros biplane. The pilot's seat is placed in the recess, and is prevented from sliding about by the steel clips shown. On the right is shown a section of the tank, with the internal bracing rods and baffle plates. The insets show the brackets supporting the tank, and the arrangement for tightening the straps that hold the tank.

Constructionally the petrol tanks are of interest in that they have been internally braced by rods running across from side to side, the attachment of the rods being visible on the outside of the tank as shown in Fig. 12. To prevent the petrol from slushing about inside when the tank is nearly empty baffle plates are fitted dividing the main tank longitudinally into five compartments, communicating with each other through the circular openings shown in the section of the tank, Fig. 12. As the supply pipe leaves the tank fairly high up—it can be seen on the front right-hand side of the tank in Fig. 12—it is carried down inside to the bottom of the tank so as to enable the last drop of petrol to be forced out and into the carburetor. The main tank is mounted on brackets as shown in one of the sketches, and is secured by metal straps having an arrangement for adjustment.

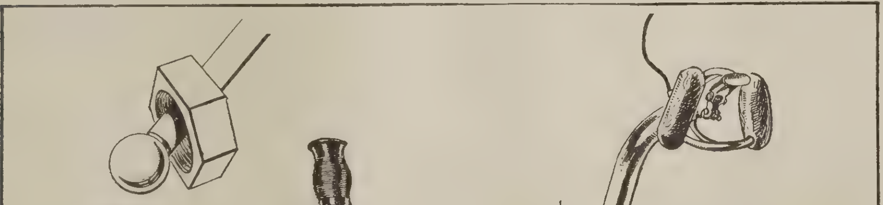


Fig. 13.—The controls of the Albatros biplane. Insets show the ball and socket joint for the control lever locking arrangement, and hand grip with gun trigger on the main control lever.

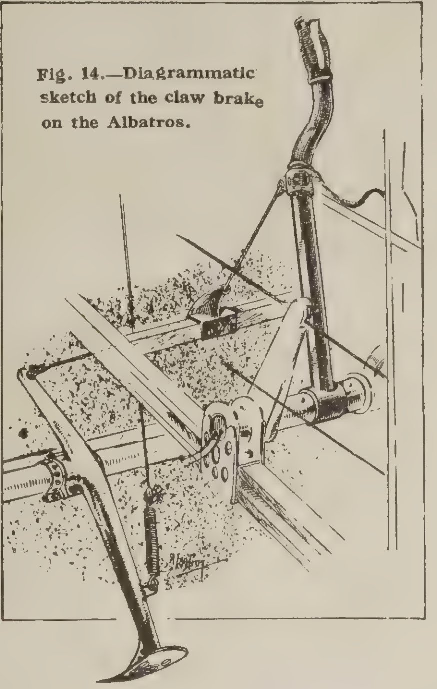


Fig. 14.—Diagrammatic sketch of the claw brake on the Albatros.

In Fig. 13 is shown the general arrangement of the controls. There is a transverse rocking shaft of which are mounted at each end crank levers for operating the elevators, while in the centre, pivoted so as to be free to rock laterally, is mounted the main control lever. Mounted on the transverse shaft, but not moving with it, is another lever, which operates the claw brake mounted on the wheel axle. The arrangement of this brake is shown in Fig. 14. By pulling the lever the free end of the claw brake is pulling upwards, thus causing the claw to dig into the ground. On releasing the lever, the brake is returned to its normal position by the action of the spring shown in the sketch.

The transverse rocking shaft is carried, as indicated in Fig. 14, in two bearings mounted on the lower longerons. A forward and backward movement of the control lever causes the shaft to oscillate, and with it the two crank levers to which are attached the elevator control cable. These cables run from the crank lever, around a pulley slightly forward of the transverse shaft as shown in the sketch, and hence to the top crank lever on the elevator. The return cable runs from the crank on the under side of the elevator to the crank on the transverse shaft. En route these cables pass over pulleys mounted in the rear position of the fuselage, these pulleys being shown in detail in some of the accompanying sketches (Fig. 15).

As regards lateral control, the general arrangement of this is indicated in diagrammatic form in Fig. 16. From the control lever the direct cable passes over a pulley on the transverse shaft, along through the bottom wing, around another pulley in the wing, and hence to the rear half of the aileron crank lever. The return cable runs from the front half of the aileron crank lever, around another pulley in the lower wing, through the wing and through the transverse shaft to a pulley on the other side of the control lever, and hence to the screw on the control lever. The details will be clear from Fig. 13.

The foot bar operating the rudder is mounted on a pyramid of steel tubes, and the rudder cables are taken, not, it will be seen, from the foot bar itself as is generally done, but from a short lever projecting forward at right angles to the foot bar. From this lever the cables pass over pulleys and to the cranks on the rudder. It will be seen that provision has been made for making adjustments of the foot bar to suit pilots of different height by fitting on extra foot bar. If the machine is to be flown by a taller pilot, this is removed and the main foot bar used. Wire clips are provided, it will be noticed, for accommodating the pilot's heels so as to prevent his feet from slipping off the foot bar.

As in the majority of German machines, provision has been made for locking the control lever in any position, either flying level, climbing, or descending. This is accomplished by means of a collar free to slide along the control column, but being split and provided with a bolt for tightening up, when the collar is locked in position on the control column. Anchored to this collar by two screws is a fork end, from which

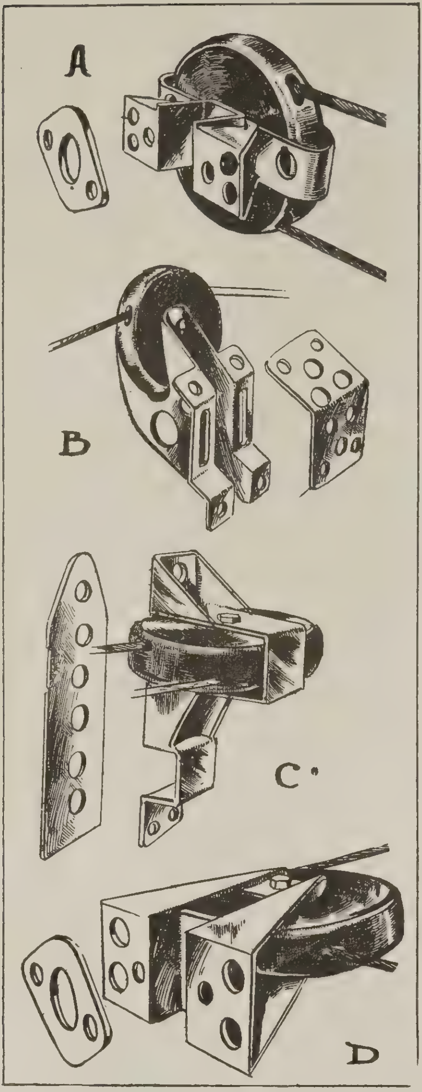


Fig. 15. "A" shows the pulley over which the elevator cable passes after leaving crank lever on rocking shaft (See Fig. 13). "B" the pully mounted on the top longeron (in front of the tail plane) over which the elevator control passes. "C" This pulley bolted to the middle longeron just ahead of the tail plane guides the elevator cable. "D" This pulley guides the rudder cable in front of the footbar.

a tube runs down and forward to terminate in a ball and socket joint secured to the bottom of the fuselage. This ball and socket joint, it will be seen, enables the control column to be moved freely in any direction, and to allow it to be moved from side to side, even when the forward movement of the column is prevented by locking the collar. In this manner, the pilot can lock the elevator, while operating the control column from side to side for lateral control with his knees.

As far as can be ascertained, although the machine gun was not in place on the machine as exhibited, one synchronized machine gun was fitted, resting on top of the fuselage on the right-hand side. The pilot operated this gun by means of the trigger on the hand-grip of his control lever, which is shown inset in Fig. 13.

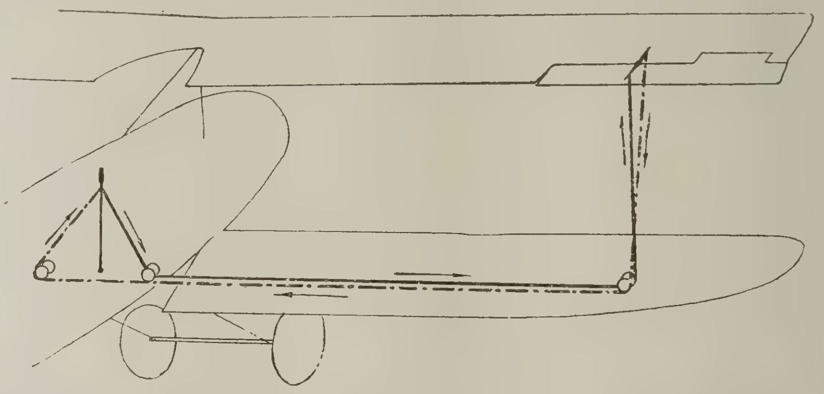


Fig. 16. Diagram of the aileron control system of the Albatros Fighter

While on the subject of controls, reference might be made to the crank levers on the elevator and rudder. These are shown in Fig. 17, from which their construction will be evident. The crank lever of the elevator has projecting from it a tapering tube running to the trailing edge of the elevator. The tubular rudder post is working in bearings similar to those described in our last issue when dealing with the hinges for the elevator. At the bottom the rudder tube fits into and is supported by a socket carried on a clip bolted to one of the transverse bulkheads of the fuselage. A peculiarity characteristic of the Albatross is the method of attaching the control cables to the crank levers. A socket is formed in the end of the crank lever, and into this fits a cup-shaped piece of steel machined on one of the bolts of the wire strainers, much in the same manner as the terminal attachment of the main lift cables. Thus any vibration in the control cable is not transmitted to the crank lever, the cup-shaped head of the turn-buckle bolt being free to move in its socket in the crank lever.

Reference has already been made to one part of the armanent of the Albatros, namely, the synchronized machine gun operated by the pilot from the trigger on the main control column. In addition there is a movable machine gun mounted on the usual gun ring in the rear cockpit. The general arrangement of this gun mounting is shown in the sketch, Fig. 18. The gun ring itself is built up of thin three-ply wood, and runs on small rollers on its support so as to reduce friction. It is prevented from tilting up by wooden angle pieces screwed to its underside and overlapping the fixed support. The whole arrangement looks somewhat clumsy, but is apparently quite light, and the strength is probably reasonably good, as the three-ply of which the gun ring is made is made up of different curvatures, each of which tends to strengthen the others.

The machine gun is supported on the gun ring by a swivelling fork, which can be raised and lowered as required, and which can be locked in any desired position by the locking arrangement indicated in the sketch of the general arrangement. In addition to its circular movement integrally with the gun ring, the machine gun may be swung laterally on its pivot in the gun ring. Here also a locking device is provided in the shape of a split collar locked by an L bolt, as shown in one of the insets. The other inset in Fig. 18 shows the lever by means of which the gun ring is locked in any desired position. A rocker arm composed of two steel strips is pivoted in its center on a pillar projecting downwards from the gun ring. At one end this rocker arm carries a plate welded to the two steel strips of the rocker, and at the other it carries the hand lever which is so formed and pivoted as to give an eccentric movement when the lever is swung through an arc. The *modus operandi* will be clear from the sketch. When the gun ring has been swung around to the desired position the hand lever is pushed down; in so doing the eccentric forces the inner end of the rocker down, thus causing its outer end carrying the flat plate to move up against the fixed support for the gun ring and thereby locking it. A pull on the lever instantly releases the gun ring if it is desired to swing the gun around to another quarter.

As presumably it frequently happens that the gunner wishes to fire from a standing position his seat has been so arranged as to swing into a vertical position as soon as it is relieved of its weight. This is accomplished by means of a spring under the seat, as shown in Fig. 19, which is, we think, self-explanatory. A strip of

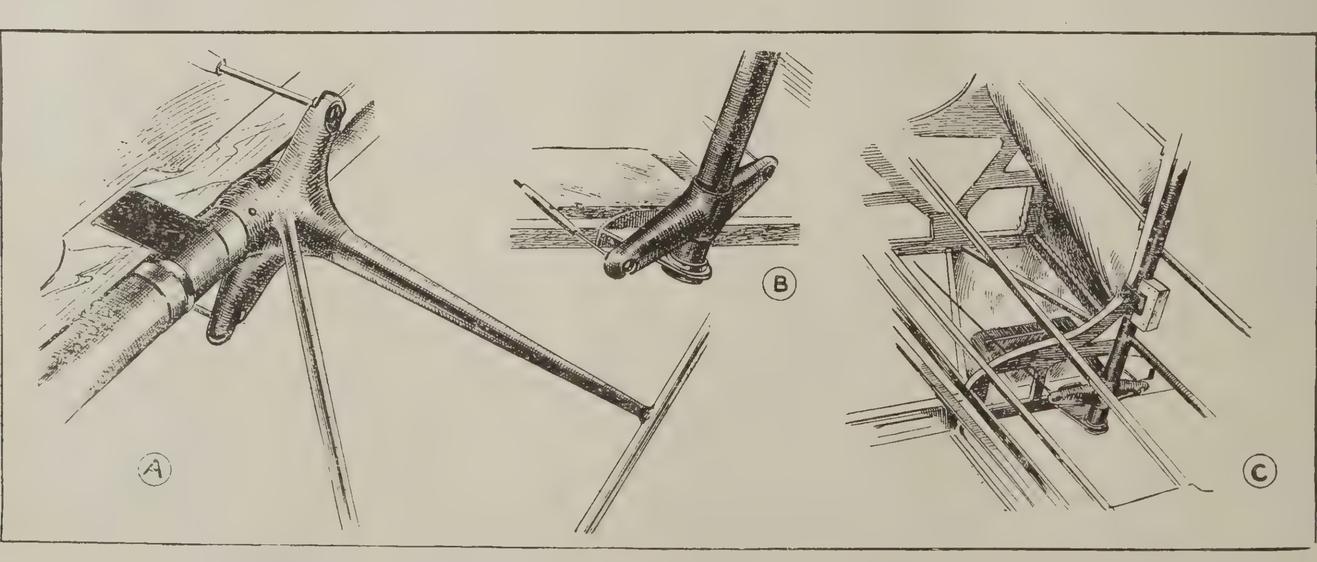


Fig. 17. Elevator and rudder crank levers on the Albatros biplane. (A) Elevator crank lever with its ball socket joint for the turnbuckle. (B) Bottom rudder bracket and crank lever. (C) Mounting of the rudder.

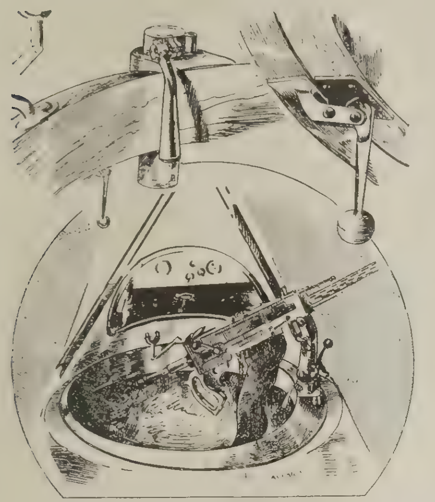


Fig. 18. The machine gun and its mounting on the Albatros Fighter. The bag for the spent cartridges should be noted. When not in use, the butt of the gun rests in the clip shown. The two smaller sketches show the locking devices for the gun pivot (left) and the gun ring (right)

wood runs transversely under the seat and projects a short distance on either side. These projections rest, when the seat is in a horizontal position, in brackets secured to the sides of the fuselage.

The Albatros biplane belongs to the C class, that is to say, is a general utility machine variously used for fighting, reconnaissance, artillery spotting and photography, and is therefore not to be considered a bombing machine. It is, however, provided with racks for a small number of bombs—four, to be exact—presumably by way of cases of emergency when a suitable target might present itself. Fig. 20 is a diagrammatic perspective view of the bomb racks and bomb release gear. The bombs are secured underneath the main tank in the pilot's cockpit, but they are released by the gunner in the rear cockpit by means of a small lever and quadrant shown in Fig. 20.

The bomb racks are in the form of sheet steel supports, against the bottom of which rest the nose and the tail of the bombs respectively. These brackets are secured to transverse members in the bottom of the fuselage, which have been omitted in the drawing for the sake of clearness. The bombs themselves are supported by a steel strap or band, passing underneath and approximately under the middle of the bombs. At one end the straps are hinged, while at the other they are provided with an eye, which is secured in the hook under the release trigger. One of the sketches in Fig. 20 shows in more detail the hook in which the eye of the strap rests, and the trigger by means of which the strap is released. The trigger is pivoted near its centre, and has an upward projection to which is attached a small coil spring resting in a groove in the base supporting the hook. When the cam on the transverse shaft presses down the rear end of the trigger, the front end moves upward against the tension of the coil spring mentioned above, thus releasing the strap and with it the bomb.

As regards the cams which operate the bombs, these are mounted on a transverse shaft running across the bottom of the fuselage. There are four cams, each operating its trigger, but the gearing of the camshaft is such that it requires five pulls on the lever in the gunner's cockpit to rotate the shaft through a complete revolution. One of these pulls of the lever has no corresponding cam on the shaft, and has, it appears, been incorporated in order to provide an equivalent of a safety catch. When all the bombs are in place the first pull on the lever does not release a bomb, but merely brings the cam for bomb No. 1 into position, ready to press, on the next pull of the lever, the trigger for the first bomb. This has evidently been done as a precaution against accidentally releasing a bomb until the machine is approaching an objective.

We now come to consider the method of operating the transverse camshaft. Near the right-hand side of the fuselage there is mounted on the camshaft a small ratchet having five teeth, as shown in Fig. 20. On this ratchet is a small cam, roughly of cone shape. This cam engages with grooves in the pulley around which passes the operating cable. A small leaf spring engages at the proper moment with the notches in the ratchet and prevents the shaft from rotating in the reverse direction. One end of the operating cable is attached to a coil spring secured to the side of the fuselage, and passes from there around the pulley to the lever in the gunner's cockpit. Assuming that the first cam is in position ready to release its bomb, a backward pull of the lever rotates the pulley and with it the ratchet and camshaft, thus pressing down the trigger of one of the bomb racks and releasing a bomb. When the gunner releases the lever this is pulled forward to its normal position by the spring on the side of the fuselage. The little leaf spring engaging with the ratchet prevents this and the shaft from following the pulley round in the opposite direction, and the cam on the ratchet sliding up the sloping bottom of one of the five grooves in the face of the pulley forces the pulley away from the ratchet against the compression of a small coil spring shown in the sketch. By the time the lever has reached its forward position, the pulley has revolved to such an extent as to bring the cam on the ratchet into the next groove in the pulley, and when the lever is again pulled the whole action is repeated. The sketch will probably help to make the action clear.

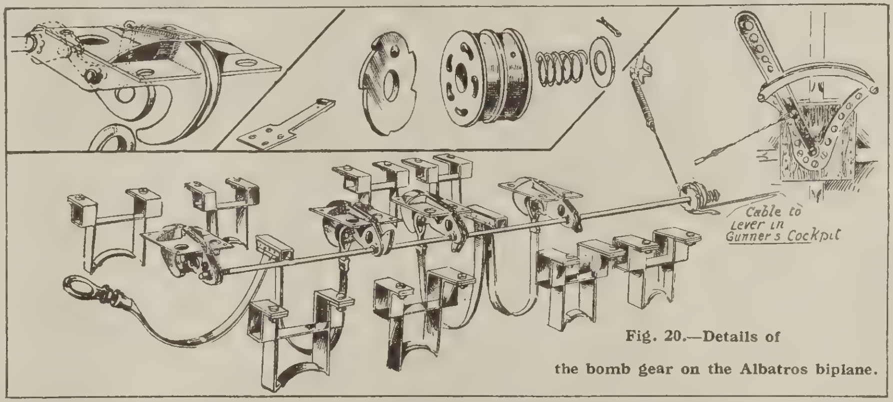


Fig. 20.—Details of the bomb gear on the Albatros biplane.

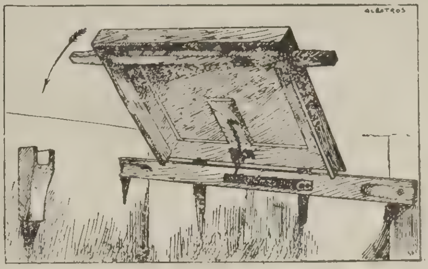


Fig. 19. So as to be out of the way when the gunner is firing from a standing position, the seat on the Albatros Fighter is hinged and sprung as shown in this sketch

In addition to a bomb release lever, there is in the gunner's cockpit another lever, the function of which appears to have been to engage and disengage a clutch near the engine, by means of which a drum is operated carrying the aerial of the wireless. In the bottom of the gunner's cockpit, near the left-hand side, is an octagonal opening in the floor, in which, so far as we can make out, the camera was mounted. The compass, so as to be visible from both cockpits, has apparently been mounted in a circular opening in the right-hand lower main plane.

We now come to deal with the wings of the Albatros. These are, generally speaking, of the construction favored by the Albatros designer, that is to say, the front spar is well forward close to the leading edge, and the rear spar is approximately half-way along the chord. In addition, there is a third false spar, which is not, however, connected up to the body nor supported by any struts, and which cannot therefore be considered as taking any particularly important part of the load. It will, therefore, be realized that the rear main spar may at small angles of incidence, when the centre of pressure moves backwards, be called upon to support all or nearly all of the load. This has evidently been guarded against in the Albatros by making the rear spar of generous proportions. Both main spars are made of spruce, and are of the box type, consisting of two halves spindled out and glued together with a hardwood tongue running through both flanges. The ribs are of I-section, with spruce webs and ash flanges. Between the main spars false ribs are employed half-way between the adjoining main ribs, so as to better

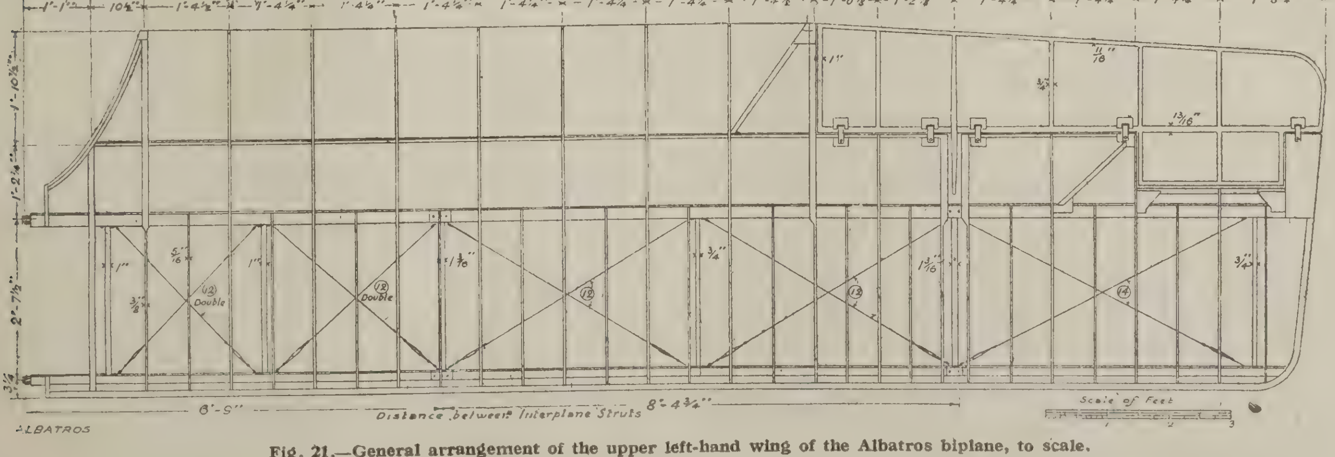


Fig. 21.—General arrangement of the upper left-hand wing of the Albatros biplane, to scale.

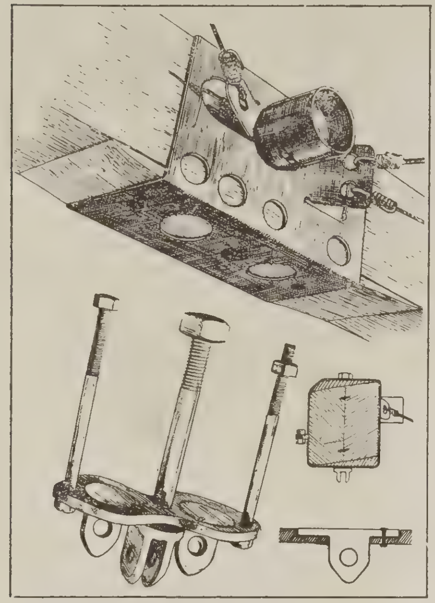


Fig. 22. Sheet steel spar box and socket for compression tube of the upper plane of the Albatros biplane. The bottom sketch shows the attachment of the terminals for the interplane cables and struts

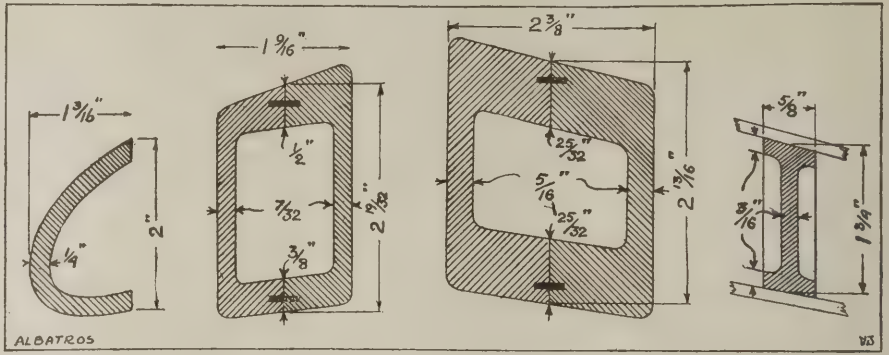


Fig. 23. Sections of the leading edge, main spars and false spar of the Albatros biplane

preserve the curvature of the wing for this distance.

The general arrangement of the upper left-hand wing is shown with dimensions in Fig. 21, from which the general lay-out of the wing will be clear. The internal drift wiring is in the form of five bays, the compression struts for this wiring being in the form of circular section steel tubes. In the two inner bays both drift and anti-drift wires are in duplicate and are approximately 12 S.W.G. The next two bays have single wiring, also of 12 S.W.G., while the outer bay has single wiring of 14 S.W.G

The attachment for the compression tubes and the drift and anti-drift wires is shown in Fig. 22. A box of thin sheet steel surrounds the spar at this point and is bent over and bolted as shown in the small section in Fig. 22. On the inner face of the spar this sheet steel box has two wiring plates stamped out, which receive the drift and anti-drift wires. A short cylindrical distance piece is welded on to the box, and around this fits a short tubular sleeve held in position by a slit pin. This sleeve forms a socket for the tubular compression strut.

Vertically the spar is pierced at this point by three holes, for the bolts securing the interplane strut and the two interplane cables. The attachment for the latter is shown in Fig. 22. The base plate has machined in it two recessed circular openings which receive the two terminals for the cables. These terminals are prevented from rotating by a small rivet as shown in the sectional view. In order to further strengthen the spar at the point where it is pierced by these three bolts, the spar is left solid for a short distance on each side of the box, and packing pieces are interposed between the box and the spar, so as to bring it up to an approximately rectangular section in order to get the bolts coming through the spar and base plate at right angles.

In Fig. 23 are shown sections, to scale, of the two main spars, the false spar, and the leading edge. The trailing edge is, as in the majority of German machines, in the form of a wire.

Fig. 24 shows the shape and dimensions of the wing section. As in nearly all German machines, the camber is, it will be seen, extremely great, both as regards the upper and lower surface.

The precise object of employing such a wing section is not at once apparent, but it should be remembered that the German machines carry a comparatively great load per square foot of wing surface, and the probabilities are that the section has been designed with a view to enable the wing to support this high load at comparatively great altitudes, and has, therefore, probably an excess resistance at lower levels.

This is not quite clear, however, and it would be extremely interesting to have the results of wind tunnel tests on some of these German sections, and we sincerely hope that the National Physical Laboratory may be able to find the time to carry out such experiments.

Superficially the section does not impress one as being particularly efficient, but wind tunnel tests might reveal the fact that it is a good section for carrying high loading at considerable altitudes.

(To be continued)

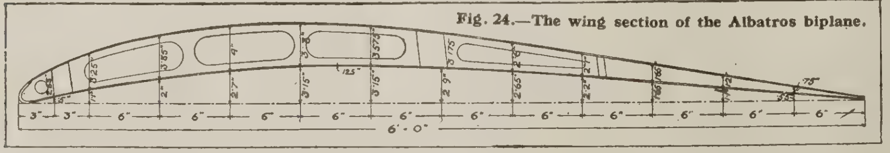


Fig. 24.—The wing section of the Albatros biplane.

(*Continued from page* 437)

of planes." This is another gross fallacy; we cannot really begin the construction of airplanes until our engine and its working horsepower has been established. In other words, except for the acquired material experimentation carried on under various producers and paid for by the cost-plus contract system, enjoyed by manufacturers who are agreeable and acceptable to the ring, we have accomplished nothing in our aeronautic program. Charges could not be more serious. Charges more grievous could not be made against a department or a group of men. Seven or eight investigations have been made besides my own and there is no single, definite denial of anything I charge. Why is it then that this offends? Why is it that placing the truth before the authorities fails for months to meet with response and finally with brusque rebuke, and why after the work is done and delivered a month or more should I receive a letter from you refuting the authority which alone brought me to Washington and under which I have worked so long?

Little can I add to what I have said, and there is little that I wish to add. I am now certain my services have at least compelled some kind of an investigation, and I have at least informed the country of its needs and the camouflage deliberately planned by a group of men entrusted with a great arm of our military machine has come to an end—I hope it has come to an end, but the chart of reconstruction which I saw the day before yesterday fills me with definite alarm.

GUTZON BORGLUM."

Complained Early of Obstruction

The other letter to the President made public by Mr. Borglum follows:

"Washington, D. C., Jan. 21, 1918.

Mr. Dear Mr. President:

I am placing in your hands today a report upon the aeronautic situation, entering as deeply as I have been able to do considering the circumstances.

The statements, grave as they appear, are based upon a mass of information available to you or to any one you may hereafter designate to receive it, except those who have used their official position to delay, mislead, and obstruct the nation's work and my effort to get the truth and so give value to my inquiry.

Before I had been here twenty-four hours I found that my presence and purpose were known; that I was watched; that officials who should have aided me had intercommunicated, attempted to mislead me and block every avenue I approached. I was in a quandary as to what was best to do, resort to the authority of your letter and demand vesture of such authority from the Secretary of War as was necessary to secure data, or to hoe my row alone. I informed the Secretary of War of my difficulties—with the result that I have made my investigation without aid.

Further than this, I have disturbed no one. My own large personal acquaintance stood me in good stead; I gained entrance and secured evidence everywhere, and fortunately have been able to connect the broken links of a chain of dishonesty and disorder that runs throughout our production department. I have seen records, received copies of reports, been the centre of information volunteered from officers, members of Congress, merchants and manufacturers. I have sent agents to the factories, was refused or equally hindered by delay by General Squier, and so what I send here has been wrung from official Washington from men sworn to help, men whose whole lives would be benefitted by frank service in the work they are engaged upon for you and for the nation.

I am speaking in this way because I have only the faintest hope that what I have done will be or can be quickly and constructively applied to our departmental government. What I suggest will require men of courage, fearless prosecution, almost immediate seizure of the manufactories engaged in the work here investigated, without reference to the unhappy men who have crept into regular army officers' uniform and who will get in time a regular army officers' court-martial.

(*Continued on page* 469)

MATHEMATICAL EXPRESSIONS FOR CLIMB, RATE OF CLIMB AND CEILING OF AN AEROPLANE*

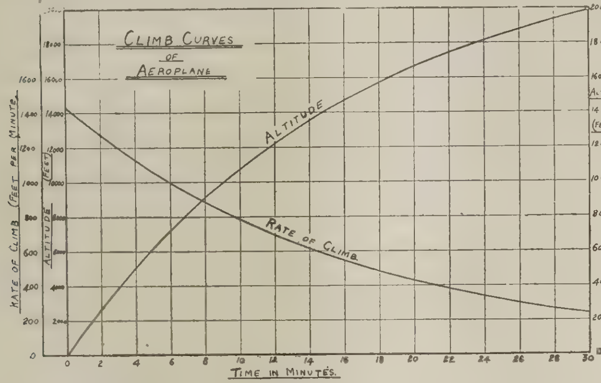
By E. F. C., B.Sc.

THE altitude, at any time, of an aeroplane climbing at its maximum possible rate, is very nearly represented by a mathematical law similar to that for the rise of electric current in an inductive circuit. Thus if h be the altitude at a time, t and H the "ceiling" of the machine, we have the relation

$$h = H\left(1 - e^{-\frac{t}{T}}\right) \qquad (1)$$

where e is the base of the natural or Napierian logarithms and T is a time, which, by analogy with the electrical case, may be called the "time constant" of the climb, being the time required by the altitude to become $1 \ \frac{t}{T}$ or .632 of its final value, *i. e.*, for the aeroplane to rise to a height equal to 0.632 of its ceiling.† Except that h and H and also t and T must be measured in the same units of height and time respectively, there is no restriction in this formula on the units used.

This being the case, it is possible to find expressions for the rate of climb at any time and at any altitude, and also an expression for the ceiling of the machine, which latter is quite simple. We will first show how to obtain such expressions from the equation already given and afterwards will give the application of these to a practical case.



The rate of climb is obtained by differentiating h with respect to t, and is

$$\frac{dh}{dt} = \frac{H}{T} e^{-\frac{t}{T}}, \qquad (2)$$

which is an equation giving the rate of climb in terms of the time, the ceiling, and the time constant.

By eliminating the exponental $e^{-\frac{t}{T}}$ from equations (1) and (2) we obtain an equation giving the rate of climb in terms of the altitude, the ceiling, and the time constant. This equation is

$$\frac{dh}{dt} = \frac{H}{T}\left(1 - \frac{h}{H}\right) = \frac{H - h}{T},$$

and shows that rate of climb plotted against altitude is a straight line. If we call rate of climb r we have

$$rT = H - h$$

or

$$\frac{h}{H} + \frac{r}{H/T} = 1 \qquad (3)$$

which equation shows that when r is plotted against h, the intercept (H) of the straight line on the altitude axis is the ceiling of the machine (where rate of climb $r = o$) and the intercept $\left(\frac{H}{T}\right)$ on the rate of climb axis is the initial rate of climb (*i. e.*, rate of climb when $h = o$).

The simple expression for the ceiling of a machine is obtained as follows:

After any time t from the start let the observed altitude of the aeroplane be h_1, and after a time $2t$ let it be h_2. Then we have

$$h_1 = H\left(1 - e^{-\frac{t}{T}}\right)$$

$$h_2 = H\left(1 - e^{-\frac{2t}{T}}\right)$$

Let us write X for the exponential $e^{-\frac{t}{T}}$ for convenience, then:—

$$h_1 = H(1 - X)$$
$$h_2 = H(1 - X^2)$$

whence by division $\frac{h_2}{h_1} = 1 + X$

but since $\frac{h_1}{H} = 1 - X$

$$\therefore \frac{h_1}{H} = 2 - \frac{h_2}{h_1}$$

and

$$H = \frac{h_1}{2 - \frac{h_2}{h_1}}$$

which gives the ceiling of the machine in terms of the altitude h_1 at time t and the altitude h_2 at time $2t$. (Note that t may be any time whatever during the climb.) So all we require to calculate the ceiling of a machine is the altitude after any time, and the altitude after double that time.

We will now illustrate the foregoing analysis by a practical example. Observations of a certain aeroplane on a climb test showed the altitude to be related to the time after start according to the following table:

Time (minutes)—	0	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5
Altitude (feet)—	0	3300	6150	8730	10760	12610	14190	15530	16650	17600

The ceiling of the machine may be calculated right away taking h_1 as 10760 ft. after 10 minutes and h_2 as 16650 ft. after 20 minutes. We have

$$H = \frac{10760}{2 - \frac{16650}{10760}}$$

$$= \frac{10760}{.4526} = 23{,}770 \text{ feet.}$$

We may next calculate T, the time constant. The value of the exponential (which we called X for short) is (when $t = 10$ minutes)

$$X = \frac{h_2}{h_1} - 1 = .5474.$$

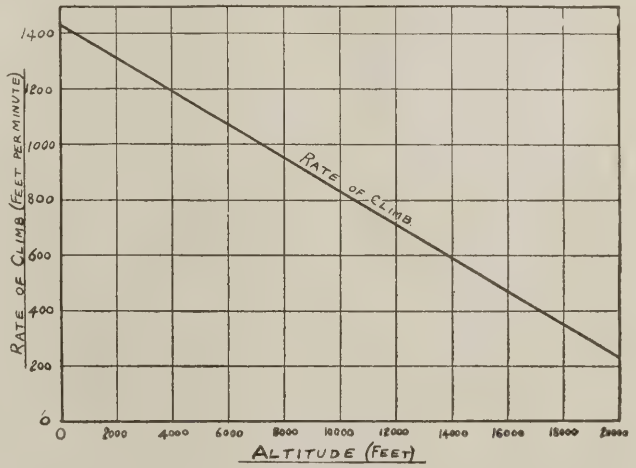
hence $\frac{10}{T} - = \log e\ .5474$

$= 2.3026 \log_{10} .5474.$
$= 2.3026 \times 1.7383$
$= 2.3026 \times = .2617$

whence $T = \frac{10}{2.3026 \times .2617} = 16.50$ minutes.

The initial rate of climb

$$= \frac{\text{ceiling}}{\text{time constant}} = \frac{23770}{16.60}$$
$$= 1432 \text{ feet per minute.}$$



Having calculated the constants of the climb, we may now write down the equations for the altitude at any time, the rate of climb at any time, and the rate of climb at any altitude. They are respectively:—

$$h = 23770\left(1 - e^{-\frac{t}{16 \cdot 60}}\right)$$

$$r = 1432\, e^{-\frac{t}{16 \cdot 60}}$$

$$\text{and } r = \frac{23770 - h}{16.60}.$$

From the first two equations the altitude and rate of climb at any time t are calculable and the figures for the altitude are found to agree closely with the table already given, so far as this table goes. We give below a table calculated from these two equations, also a table showing rate of climb at various altitudes. The results are also plotted in the accompanying curves.

Time (minutes)—	0	2.5	5.0	7.5	10.0	12.5	15.0
Altitude (feet)—	0	3320	6180	8640	10760	12575	14140

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* Courtesy of *Flight*.

† The time required to rise to the ceiling is mathematically infinite.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers. Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1.—Report to points named for temporary duty in the order given.

Note 2.—Report to balloon detachment, Fort Monroe, Va.

Note 3.—Take station at San Antonio, Tex.

Note 4.—Take station at Ashland, Va.

Note 5.—Report to Signal Corps Recruit Bureau, Fort Wayne, Mich.

Note 6.—Report to district manager of equipment, 15 Park Row, New York, N. Y.

Note 7.—Report to Signal Corps construction troops, Fort Wayne, Mich.

Note 8.—Take station at Detroit, Mich.

Note 9.—Report to Major Arthur E. Wilbourn, Columbus, Ohio, for duty with board of officers.

Note 10.—Report to Walter Reed General Hospital, Washington, D. C.

Note 11.—Wire chief, military intelligence branch of executive division of the General Staff, Room 652, 1156 Fifteen St., N. W., Washington, D. C.

Note 12.—Report to aviation supply depot, Fairfield, Ohio.

Note 13.—Proceed to Cleveland, O., then to Capt. James G. Heaslet, 870 Woodward Ave., Detroit, Mich.

Note 14.—Report to manager of equipment, 870 Woodward Ave., Detroit, Mich.

Note 15.—Proceed to New York, N. Y., temporary duty; then to district manager of equipment, Buffalo, N. Y.

Note 16.—Report to Lieut. Fred G. White, 870 Woodward Ave., Detroit, Mich.

Note 17.—Report to Camp Alfred Vail, Little Silver, N. J.

Note 18.—Report to Madison Barracks, N. Y. for duty with photographic detachment.

Note 19.—Take station at Salem, O.

Note 20.—Report to Nordyke & Marmon, Indianapolis, Ind.

Special Orders 93 to 99 Inclusive

A

Adams, James D.	DIK
Allison, Stanton W.	RWT
Atkinson, Harold K.	DIK
Andrews, Harold Floyd	SLR; RWT
Andrews, Frederick B.	CRI
Aubuchon, Joseph Montgomery	SLR; DIK
Atterbury, John C.	SLR
Arthur, Rex P.	TFT
Adams, Chester Askley	SLR; LDT
Armantrout, Guy E.	FRF
Anderson, Clarence	SLR; RSD
Andrews, Martin H.	FRF
Alvord, Lincoln	SLR; KST (2)
Anderson, Richard H.	FRF
Ashton, Thomas H.	FRF
Appleman, Earl	PFO
Allen, John A.	FRF
Atkinson, Harold K.	FRF
Acheson, Alexander M.	FRF
Arnold, Wellington	UIU
Andrew, Paul Frederick	SLR; KST
Abney, Louis D.	SBI

B

Bausher, John G.	DIK
Buckley, Charles J.	DIK
Brofft, Rudolph E.	DIK
Boyle, Robert D.	DIK
Burr, Richard O.	DIK
Braun, Bruce E.	DIK
Buck, Edward H.	DIK
Bennun, Chauncey, H.	TMA
Bell, William P. B.	WFO
Baker, John H.	DIK
Burgess, George H.	TFT
Bailey, James Ryskin	SLR
Baker, Bernhardt Herbert	SLR
Barnes, Kenneth George	SLR
Beck, William McRoberts	SLR
Blackard, Charles Galloway	SLR
Blankford, James Thomas	SLR
Bogert, Howard Zabriskie	SLR
Boulware, George Lynn	SLR
Bracken, Joseph Riordan	SLR
Brown, Clifford Allen	SLR
Buckley, Francis John	SLR
Buckmaster, Samuel Arthur	SLR
Burgin, Van Hampton	SLR
Butler, Clyde H.	SLR
Barratt, Milton	SLR
Bennett, Eugene Francis	SLR
Berglund, Carl R.	SLR
Bernhard, Robert A.	SLR
Brace, Orval L.	SLR
Bradley, Addison	SLR
Bredouy, Homer Ludwig	SLR
Buford, Joseph Swepson, Jr.	SLR
Burkett, Franz U.	SLR
Babcock, Fred David	SLR
Bancroft, Winthrop	SLR
Biche, Leon Le Roy	SLR
Bishop, John Hober	SLR
Barry, Arthur Nathaniel	SLR
Berry, Charles Henry William	SLR
Bushnell, Sherman Ward	SLR
Buysee, Charles Ernest	SLR
Bynum, Willis M.	SLR
Butts, John W.	CWT
Bradshaw, Forrest D.	FRF
Belcher, Fred W.	CSO
Banker, Willis R.	REL
Brown, William C. F.	FLR
Badenhausen, William C.	TFT

Sergeant Bernard Levey, of the Aerial Photography Section, now with the American Forces in France

Blanchard, Howard B.	FRF
Burglund, Fritz O.	LHV
Bishop, John H.	FRF
Bailey, Foster	FRF
Brownlee, Fred Parke	SLR; RSD
Boutwell, Leroy A.	FRF
Barry, Arthur H.	FRF
Baum, Leland Mason	SLR; KST (2)
Bardwell, Allen E.	FRF
Brown, Charles E.	FRF
Boatright, Bernard Deckard	SLR; KST (2)
Burr, Richard O.	FRF
Briggs, Martin C.	SLR
Baer, Milton David	SLR; EOT
Burton, James, Jr.	SLR
Banks, Frank	ELA
Bailey, Louis Charlesworth	SLR; RSD
Burleigh, Donald M.	FRF
Burrucker, William C.	FRF
Bloodworth, Thomas Stokeley Morgan	SLR; KST
Bonney, Ulysses H.	FRF
Biche, Leon L.	FRF
Bateman, George Levi	SLR; EOT
Byington, March Maeck	SLR; KST
Barrington, Francis	FRF
Brodrick, William Joseph Hayes	SLR; RSD
Brookley, Wendell Holzworth	SLR; KST
Bush, Bradford Stetson	SLR
Brooks, Roger Eaton	SLR; KST (2)
Boardman, Vinson Runyan	SLR; KST
Brady, Cletus J.	PFO
Bradford, Thomas Leonard, Jr.	SLR; EOT
Brissel, William Seymour	SLR; EOT
Babcock, Fred D.	FRF
Baildon, John Karl	SLR; RSD
Brown, Arthur V.	SLR; EOT
Brofft, Rudolph H.	FRF
Boulware, George Lynn	SLR; CWT
Barnes, Kenneth George	SLR; CWT
Brown, Clifford Allen	SLR; RWT
Blackard, Charles Galloway	SLR; EOT
Bogert, Howard Zabriskie	SLR; GLC
Buckley, Francis John	SLR; EOT
Beck, William McRoberts	SLR; KST (2)
Burgin, Van Hampton	SLR; DIK
Baker, Bernhard Herbert	SLR; DIK
Butler, Clyde Henry	SLR; KST
Blandford, James Thomas	SLR; KST
Buell, Maurice L.	TFT
Burr, Hudson C.	TFT
Blake, Joseph F.	TFT
Burton, John F.	TFT
Babcock, Fred David	SLR; CJW
Bassett, James Wellington	SLR; KST
Brace, Orval Lester	SLR; SMM
Bancroft, Winthrop	SLR; CJW
Biche, Leon LeRoy	SLR; CJW
Boyle, George L.	CSO
Bennet, Eugene Francis	SLR; DIK
Bredouw, Homer Ludwig	SLR; DIK
Buford, Joseph Swepson, Jr.	SLR; DIK
Bermant, Lester Clifford	SLR; KST
Bushnell, Sherman Ward	SLR; KST
Boyd, John P.	FRF
Berry, Henry William	SLR; PFO
Bynum, Willis Mark	SLR; PFO
Barry, Arthur Nathaniel	SLR; PWM
Burkett, Franz Upham	SLR; VBW
Buysse, Charles Ernest	SLR; LDT
Brock, Henry I.	OSU
Blair, Paul R.	UTA
Black, Avery J.	FRF
Blair, Samuel A.	FRF
Bancroft, Winthrop	FRF
Banfill, Charles Y.	FRF
Berman, Morris	UIU
Bishop, John Heber	SLR
Barrett, Philip A.	FRF
Brooks, Edward J.	FRF
Beehler, Charles H.	FRF
Bolton, Edward D.	WAC
Brock, John B.	Note 13
Burns, Edward	Note 3

C

Collins, Ambrose S.	FLR
Conant, Rollis G.	DIK
Coward, Raymond Stewart	DIK
Cowan, Royal W.	DIK
Crowell, Elmer A.	DIK
Culver, Charles Aaron	MJR
Caldwell, Robert M.	TMA
Carter, Keith	SLR
Castator, Frederick B.	SLR
Chapman, Wendell Phillips	SLR
Clark, Melville N.	SLR
Coffee, Harry Buffington	SLR
Conley, Frank Walter	SLR
Copeland, Norman Reid	SLR
Corrington, Julian Dana	SLR
Cudlipp, Walter Frank	SLR
Cavanaugh, Stephen Edward	SLR
Carrier, Alfred Cornelius	SLR
Connolly, Cecil Herman	SLR
Cummings, Frank Joseph	SLR
Carlton, Henry Fisk	SLR
Carlson, Carlyse R.	SLR
Cassiday, Benjamin Buckles	SLR
Campbell, Clarence Preston	SLR
Christiansen, Joseph Kay	SLR
Coesfeld, Henry Michael	SLR
Crawford, John Sanderson	SLR
Cutler, Felix Vining	SLR
Chamberlin, Walter, Jr.	SLR
Carey, John Lawrence	SLR
Carlton, Richard Paul	SLR
Cover, George Ganiard	SLR
Crawford, Norman Frame	SLR
Crell, John Merl	SLR
Cotting, Charles E., Jr.	SLR
Crissey, Sherman B.	FRF
Cortright, Edgar M.	FLR
Connolly, Francis A.	HHN
Cooper, Arnold D.	VBW
Conner, William B., Jr.	FLR
Crafts, John Andrew	SLR; KST
Campbell, Alexander	SLR; KST
Case, Harold S.	FRF
Cabell, Philip Frank	SLR; LDT
Cavagnaro, James Finley	SLR; RSD
Chandler, Harry A.	FRF
Craigie, Karl Harold	SLR; EOT
Carmine, John Walter Smith	SLR; KST (2)
Chamberlin, Walter	FRF
Carroll, Alfred Bailey	SLR; KST (2)
Crandall, Norris Ingersoll	SLR; KST (2)
Cutler, Felix V.	FRF
Cassiday, Benjamin B.	FRF
Conway, John Somersette, Jr.	SLR; KST (2)
Crawford, John S.	FRF
Clapp, Charles C.	FRF
Callender, Alfred Raymond	SLR; DIK
Cabell, Philip Frank	SLR
Cleveland, Lyman W., Jr.	PFO
Cummings, Frank Joseph	SLR; KST (2)
Connolly, Cecil Herman	SLR; AAD
Crafts, John A.	FRF
Clark, McKinley F.	SLR; KST (2)
Carlson, Carlyse Robert	SLR; DIK
Cowan, Royal B.	FRF
Church, George M.	TFT
Carrier, Alfred Cornelius	SLR; EOT
Carroll, William F.	TFT
Cutler, Felix Vining	SLR; CJW
Campbell, Clarence Preston	SLR; PFO
Capps, Benjamin H.	WAC
Clifford, Albert G.	WAC
Carter, Keith	SLR; PMT
Christiansen, Joseph Kay	SLR; SMM
Cole, Charles R.	WAC
Cope, Thomas D.	LHV
Chapman, Wendell Phillips	SLR; WAC
Crell, John Merl	SLR; SBI
Clark, Earl W.	FRF
Crawford, Daniel McL.	FRF
Clark, Melville Nathaniel	SLR; DIK
Conley, Frank Walter	SLR; DIK
Curry, James T., Jr.	FRF
Cudlipp, Walter Frank	SLR; DIK
Crawford, Norman Frame	SLR; SMM
Clarkson, John J.	WAC
Crawford, John Sanderson	SLR; CJW
Carlton, Richard Paul	SLR; BST
Connolly, Maurice	WFO
Coleman, Raymond M.	DIK
Carey, John Lawrence	SLR; TMA
Castator, Frederick Barwick	SLR; WAC
Cowan, Robert S.	KST
Carrier, Roy Dow	Note 3; Note 11
Copeland, Normand Reid	SLR; DIK
Cover, George Ganiard	SLR; ADT
Cassiday, Benjamin Buckles	SLR; CJW
Coesfeld, Henry Michael	SLR; FOB
Chamberlin, Walter, Jr.	SLR; CJW

D

Delana, Edward K.	DIK
Dalton, Wilfred	DIK
Day, Richard Foulke	SLR
Dayton, Lewis Allegoe	SLR
Dolan, Harry A.	SLR
Dunn, Walter Vincent	SLR
Dunton, Gardner	SLR
Drescher, Herbert Carlton	SLR
Denmark, Leonidas P.	SLR
Davis, Calvin E.	SLR
Daniel, George Edward	SLR
Dudley, Chester Patterson	SLR
Deere, Gilbert DeMorest	SLR
Durkin, Emmet James	SLR
Durston, Harry Cranston	SLR
Dale, Ralph Taylor	SLR
Da Pron, Fayette Anthony	SLR
Dauphin, Charles Henry	SLR
Davies, Owen Elton	SLR
Dutcher, Gordon L.	SLR
Dabney, Henry B.	CPR; VBW
Denniston, Edward E.	FRF
Donovan, Joseph O.	SBI
Dallas, Burnie Raymond	SLR; RSD
Dickson, David Carlyle	SLR
Dalton, Wilfred	FRF
Dowman, Charles Hale	SLR; LDT
Dixon, Jerome J.	SLR
Daniel, George E.	FRF
DeBettencourt, Manuel Andrew	SLR; DIK
Darlington, Frank	PFO
Dunn, Walter V.	PFO
Davidson, Edward Crawford	SLR; DIK
Dickinson, Robert W.	CSO
Durphy, Emmett C.	LHV
Denton, Winfield Kirkpatrick	SLR; DIK
Dorrance, George Wright	SLR; RSD
Day, Richard Foulke	SLR; EOT
Drescher, Herbert Carlton	SLR; EOT
Dayton, Lewis Allgeo	SLR; GLC
Dunn, Walter Vincent	SLR; EOT
Durar, George H.	FRF
Denny, Archibald M.	DIK
Daniel, George Edward	SLR; CJW
Dauphin, Charles Henry	SLR; WFO
Davies, Owen Elton	SLR; CRI
Dudley, Chester Patterson	SLR; FOB
DaPron, Fayette Anthony	SLR; CAF
Denis, John F.	Note 18
DeWald, William N.	TFT
Dunn, Ray A.	LHV
Dean, William E.	LHV
Dodds, Hiram E.	FRF
Dutcher, Gordon Leroy	SLR; BST
Dudley, Lloyd M.	FRF
Dale, Ralph Taylor	SLR; PFO
Durk, Francis L.	WAC

E

Evans, Louis M.	MJR
Eckman, Murray H.	SAG
East, John H.	FLR
Ellis, Richard W.	FLR
Evans, Earl F.	TFT
Edwards, Chester N.	LHV
Emley, Evan Newell	SLR
Emerson, Sigard Anthony	SLR; CWT
Eccleston, Henry Bennett	SLR
Ellison, Frederick John	SLR; EOT
Emley, Ivan Newell	SLR; CRI
Evans, William K.	Note 12
Edwards, Idwal H.	RSD
Edgerton, James C.	CSO

F

Fanning, Winthrop C.	AAD
Fantham, Murray C.	DIK
Fort, Frank B.	DIK
Frost, Edward P.	DIK
Fitzgerald, Gordon P.	DIK
Foddy, Howard K.	DIK
Fargo, Charles Henry	SLR
Fitzpatrick, William Stephen	SLR
Ford, Edward Bryon	SLR
Faulk, Theodore Ephraim	SLR
Fuller, Frederick Thompson	SLR
Fanshawe John Edmund Jones	SLR
Foster, John Edward	SLR
Freston, Herbert August	SLR
Ferrill, Richard Milledge	SLR
Foster, James D.	SLR
Fowler, George Anderson, Jr.	SLR
Freshman, Morris	SLR
Frew, William	FRF
Felt, Edmund J.	FRF
Folsom, Harold James	SLR; KST (2)
Froelich, Hugo F.	FRF
Fuller, Frederick Thompson	CJW
Farrar, William B.	FRF
Flook, Harry E.	FRF
Finley, Robert H.	FRF
Ford, Edward Byron	SLR; EOT
Fargo, Charles Henry	SLR; DIK
Ferguson, William W.	FRF
Florian, Erasmus A.	EOT
Farr, Frank R.	EOT
Foulk, Albert C.	TFT
Foster, John Edward	SLR; CWT
Fuller, Frederick Thompson	CJW
Faulk, Theodore Ephriam	SLR; FOB
Foster, James Dana	SLR; SBI
Fleischmann, Max C.	FOB; CJW; Note 1
Ferrill, Richard Milledge	SLR; SMM
Fowler, George Anderson, Jr.	SLR; PFO
Freshman, Morris	SLR; PWM
Frost, John W.	FRF
Frieson, Ernest C.	FRF

G

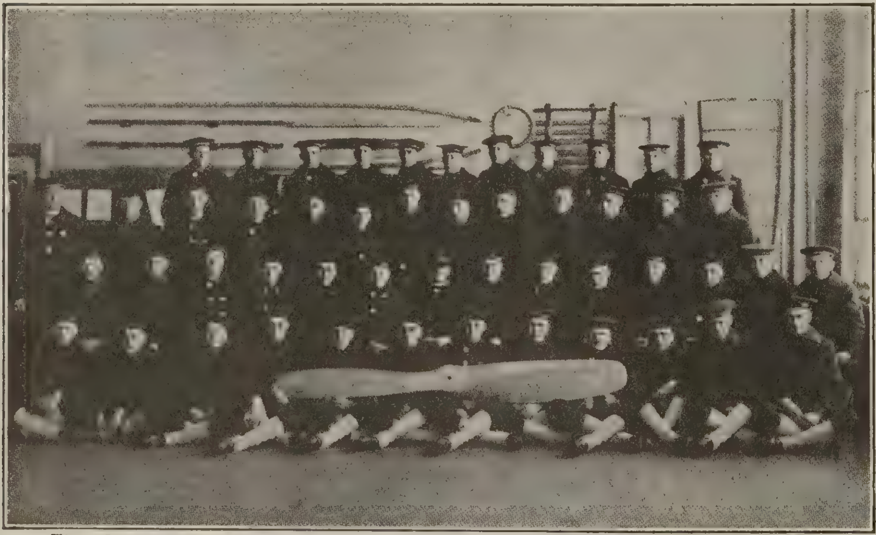
Grimes, Gerald E.	FRF
Greever, John Jay	CSO

Captain K. G. Pulliam, Jr., commanding one of the American aviation fields in France on the front

Gibson, James R.	DIK
Grant, Sidney B.	DIK
Graf, Louis Encking	SLR
Greenwood, Chester Lazelle	SLR
Griffin, Benjamin Franklin	SLR
Gordon, David W.	SLR
Gee, John Eccleston	SLR
Goodrich, Alonzo Charles	SLR
Griggs, Mark K.	SLR
Germond, Frank R.	SLR
Gilmore, Folliard F.	SLR
Gray, Charles Arthur	SLR
Graves, Henry L.	SLR
Galligher, Harry P.	LHV
Grutsch, R. D.	REL
Glenn, Grosvenor E.	FRF
Gaalaas, Rudolph L.	FLR
Garrett, William G., Jr.	CSO
Gleason, Howard Henry	SLR; KST
Glenn, Grosvenor E.	FRF
Goette, Theodore R.	FRF
Garratt, Harold Caleb	SLR; KST (2)
George, Harold L.	PFO
Gibson, James R.	FRF
George, Rowland Herbert	SLR; GLC
Geary, Harry O.	FRF
Griffith, Fred C.	FRF
Galbraith, James Stanley	SLR; KST (2)
Graham, Maurice F.	FRF
Giddings, Lee Chester	SLR;KST (2)
Graf, Louis Encking	SLR; EOT
Greenwood, Chester Lazelle	SLR; GLC
Griffin, Benjamin Franklin	SLR; CWT
Gordon, David William	SLR; DIK
Gallagher, Robert T.	FRF
Gianniny, Lawrence G.	FRF
Greene, Frederick W.	DIK
Garnettt, Joseph Harris	SLR; EOT
Geldard, Walter	TFT
Goodrich, Alonzo Charles	SLR; RII
Griggs, Mark Kidder	SLR; WFO
Gee, John Eccleston	SLR; ADT
Gilmore, Folliard Francis	SLR; DIK
Germond, Frank Robert	SLR; PWM
Gallup, Marvin	KST
Gover, James L.	FRF
Gillmore, Robert H.	KST
Glendinning, William R.	TFT

H

Hill, Armistead B., Jr.	DIK
Hogan, William A.	DIK
Hollingsworth, Frank E.	DIK
Husted, Merle R.	DIK
Hillman, Alfred D.	WFO
Host, Thomas P.	DIK
Hammond, Lawrence Darwin	SLR
Harkins, William Hamilton	SLR
Horton, William Benjamin	SLR
Hinckley, Nelson C.	SLR
Hough, Roscoe R.	SLR
Haldeman, James Flack	SLR
Hancock, William Wayne	SLR
Harding, George Jesper	SLR
Harrison, Carter Henry, Jr.	SLR
Haviland, Marston	SLR
Henderson, Randall Thomas	SLR
Hoover, Frank Wooodward	SLR
Howard, Pendleton	SLR
Howell, Samuel W.	SLR
Hunt, Everett Howard	SLR
Hall, Harold Raymond	SLR
Ham, Allen Martin	SLR
Heath, Laurence Rockwell	SLR
Hochette, Henry E.	FRF
Hutchinson, Joseph E., Jr.	CSO
Haines, Allen Kelllogg	SLR
Harden, Basil L.	SLR
Hubbard, George Charles	SLR
Humbird, James Smith, Jr.	SLR
Hogan, W. Clifton	CSO
Hermanns, Edwin F.	FRF
Heitz, Frank F.	SAG
Hardin, Ray S.	LDT
Hall, John R.	FRF
Hooper, Edwin M.	FRF
Holmes, William H.	FRF
Hollopeter, Orville Car	SLR; KST (2)
Holmes, Robert Benjamin	SLR; EOT
Hawkins, Milo	SLR
Hershman, Albert L.	SLR
Houser, Paul W.	SLR
Henriques, Charles Ransom	SLR; KST (2)
Howley, William Timothy	SLR; EOT
Harding, Paul C.	FRF
Harper, Richard S.	FRF
Hamman, E. Arden	KST
Henderson, William Abbot	SLR; KST
Healey, Claude Sprague	SLR; EOT
Hastings, Charles Eli	SLR; EOT
Hahn, Stanley W.	FRF
Harris, David Bullock	SLR; EOT
Hoisholt, Arne K. B.	FRF
Hall, Harold R.	FRF
Hensley, James W.	FRF
Hughes, Joseph Vincent	SLR; EOT
Hebberd, James L.	FRF
Husted, Merle R.	FRF
Hofflund, John L.	FRF
Hill, Rowland Everett	SLR; DIK
Ham, Allen M.	FRF
Howard, Edward P.	FRF
Hall, John R.	FRF
Hammond, Fred Robinson	SLR; RSD
Hiett, Ralph W.	CSO
Horton, William Benjamin	SLR; KST
Harkins, William Hamilton	SLR; CWT
Hinckley, Nelson Crosby	SLR; KST
Hammond, Lawrence Darwin	SLR; KST
Hough, Roscoe Rhodes	SLR; EOT
Hartwell, Cushman	LDT; WCS
Horn, Melchoir H.	CSO
House, William R.	AGC
Hoffman, Charles R.	DIK
Haines, Allen Kellogg	SLR; MDO
Hughes, Herbert	REV; Note 8; WCS
Hendry, Frank C.	UIU
Herts, Henry B.	Note 5
Hall, Harold Raymond	SLR; CJW
Ham, Allen Martin	SLR; CJW
Heath, Laurence Rockwell	SLR; CJW
Humbird, James Smith, Jr.	SLR; PWM
Hayden, Basil Leroy	SLR; SMM
Hall, John C.	FRF
Hoag, Earl S.	SBI
Hubbard, George Charles	SLR; CRI
Harmel, Falk	CSO
Holmes, Elmer M.	KST
Howry, John	CSO
Harding, George Jesper	SLR; DIK
Howell, Samuel Withers	SLR; DIK
Hoefgen, Leonard E.	FRF
Heafer, Harold W.	FRF
Happ, Clarence W.	FRF
Hunn, William F.	FRF
Hodgson, Harold A.	FRF
Hall, Russell F.	WFO
Hawley, Louis G.	WAC



First Group of Navy Quartermasters to leave Dunwoody Institute for service in the Naval Flying Corps

I

Ingle, Joseph L.	DIK
Ingalls, Justus R.	SLR; SAG
Imbrie, Harold	CSO
Ignico, Robert V.	FRF
Ives, Joseph Francis	SLR; EOT
Ingle, Joseph L.	FRF
Inmig, August Charles	SLR; ECT
Iglehart, Francis N.	LDT
Ireland, Thomas H.	TFT

J

Jackson, Joseph W.	DIK
Jackson, Clyde H.	DIK
Jefferson, Theodore	DIK
Johnson, Joseph K.	DIK
Jamison, Joy G.	RWT
Jacobson, Chester Jacob	SLR
Johnson, Harry Anton	SLR
Johnson, Allison Fletcher	SLR
Joseph, Paul Herbert	SLR
Jevon, Victor Arthur	SLR
Johnson, Forrest H.	SLR
Joy, Henry M.	SLR
Jones, John D.	CSO
Jones, Daniel V.	CSO
Jones, Lee B.	FRF
Jordan, Frank L.	SLR
Johnson, Frank Arvid	SLR; CWT
Jackson, Oliver P.	SLR
Jackson, Percival Ephrates	SLR; DIK
Johnston, Granville C.	SLR
Jensen, Jorgen Edward	SLR; KST
Jones, Wilbur B.	SLR
Johnston, Bruce	SLR; EOT
Jackson, Clyde H.	FRF
Johnston, Joseph K.	FRF
Joseph, Paul Herbert	SLR; RSD
Johnson, Allison Fletcher	SLR; KST
Jacobson, Chester Jacob	SLR; RSD
Johnson, Harry Anton	SLR; LDT
Johnson, Frank A.	DIK
Jenks, Lester A.	Note 5
Joy, Henry Murray	SLR; DIK
Johnson, Forrest Hockaday	SLR; VBW
Jordan, Frank Laurie	SLR; RII
Jacobs, Isaac W.	WAC
Joyce, William B.	MAC
Jones, Fred L.	FRF

K

Katzenberg, Herman S.	RWT
Karasek, Charles E.	CRI
Kennedy, David S.	DIK
Kuntz, Frank E.	DIK
Kelley, James M.	CSO
Kirkpatrick, Stewart R.	FRF
Keeley, James H., Jr.	SLR
Knapp, Ralph Alden	SLR
Kane, Hoyt Roland	SLR
Kipp, Joseph Henry	SLR
Kirker, Edwin C.	SLR
Knoeppel, Alfred William	SLR
Kelleher, Cornelius John	SLR; CJW
Koehler, Herbert O.	FLR
Kolosky, Adam P.	REL
Knight, Courtland Whitney	SLR
Karns, William E.	SAG
King, Walter W.	CSO
Kingsland, George D.	FRF
Kent, Warner W.	CSO
King, Ned Edwin	SLR; KST (2)
Kirkland, Samuel Noyes	SLR; DIK
Kiler, Quincey John, Jr.	SLR; RSD
Kerr, Frederick Milbank	SLR; DIK
Keller, Clarence Knapp	SLR; KST (2)
Koiner, Carl Wellington	SLR; RSD
Knowles, John Aubrey	SLR; LDT
Kirkendall, Freeman B.	PFO
Keay, Louis K.	FRF
Kelleher, Cornelius J.	FRF
Kuntz, Frank E.	FRF
Koch, Alfred S.	FRF
Kollock, William G.	MAC
Knight, Courtland Whitney	SLR; RII
Knapp, Ralph Alden	SLR; LDT
Kahin, George S.	Note 16
Kimball, Dan A.	FRF
Knoeppel, Alfred William	SLR; DIK
Kinney, Morris	ADO

L

Lasell, John W	DIK
Lobdell, Jacob K	DIK
Lundquist, Harry M	DIK
Loud, Harold E	DIK
Logan, Patrick H	TMA
Leeds, Ralph J	RWT
Lanman, Ludlow Thomas	SLR
Lavene, Clayton Charles	SLR
Lawnin, Nelson	SLR
Lyle, Samuel Patterson	SLR
Lyons, Philip Thomas, Jr	SLR
Lang, Frederick Robert	SLR
Lewis, Richard Jackson	SLR
Loraine, Charles Whitney	SLR
Lovell, McDonald	SLR
Loyhed, Donald Ames	SLR
Leslie, John Woodworth	SLR
Link, Milton P	SLR
Luce, Edgar A	SLR
Lee, Lonnie H	SLR
Lodewyck, Arthur G	CSO
Lindorff, Theodore J	APR
Lassiter, Glenn R	FRF
Lewis, Burton F	TFT
Lorenz, Harold A	TFT
Lowery, William Dalzell	SLR; KST (2)
Lovelace, Lake	SLR; KST (2)
Leazar, Augustus	SLR; LDT
Logel, Joseph Francis	SLR; LDT
Langstroth, Marshall	SLR; RSD
Lindsay, Gordon James	SLR; KST (2)
Lachmund, Harry Gray	SLR; RSD
Longstreet, Jack Yates	SLR; KST (2)
Larkin, George Reece	SLR; RSD
Luder, Leslie Jacob	SLR
Littell, William B	SLR
Loyhed, Donald A	FRF
Lobitz, Carl H	FRF
Loraine, Charles W	FRF
Leininger, William Henry	SLR; DIK
Leger, John Carothers	SLR; EOT
Lewis, Richard Phelps	SLR; RSD
Lavelle, Michael James	SLR; RSD
Lawton, Mortimer P	FRF
Lawnin, Nelson	FRF
Lenox, William J., Jr	PFO
Lyons, Phillip T., Jr	PFO
Lang, Frederick R	FRF
Liddell, Donald M	Note 6
Lovell, McDonald	SLR; FOB
Lowry, Swift M	FRF
Lawnin, Nelson	SLR; RWT
Loye, Donald P	Note 4; WCS
Lent, Leon B	Note 17
Leverich, Pierce B	WAC
Lodge, Charles A., Jr	WAC
Loraine, Charles Whitney	SLR; CJW
Lewis, Richard Jackson	SLR; FOB
Loyhed, Donald Ames	SLR; CJW
Lyons, Philip Thomas, Jr	SLR; CWT
Lavene, Clayton Charles	SLR; EOT
Lanman, Ludlow Thomas	SLR; KST
Lundquist, Harry M	FRF
Lang, Frederick Robert	SLR; CJW
Lumsden, Hugh McE	FRF
Landreth, Robert M	DIK
Levisee, Rexford B	FRF
Lovell, Charles P., Jr	FRF
Lincoln, Rush B	CSO
Lees, Herbert G	FRF
Lipscomb, McDonald E	FRF

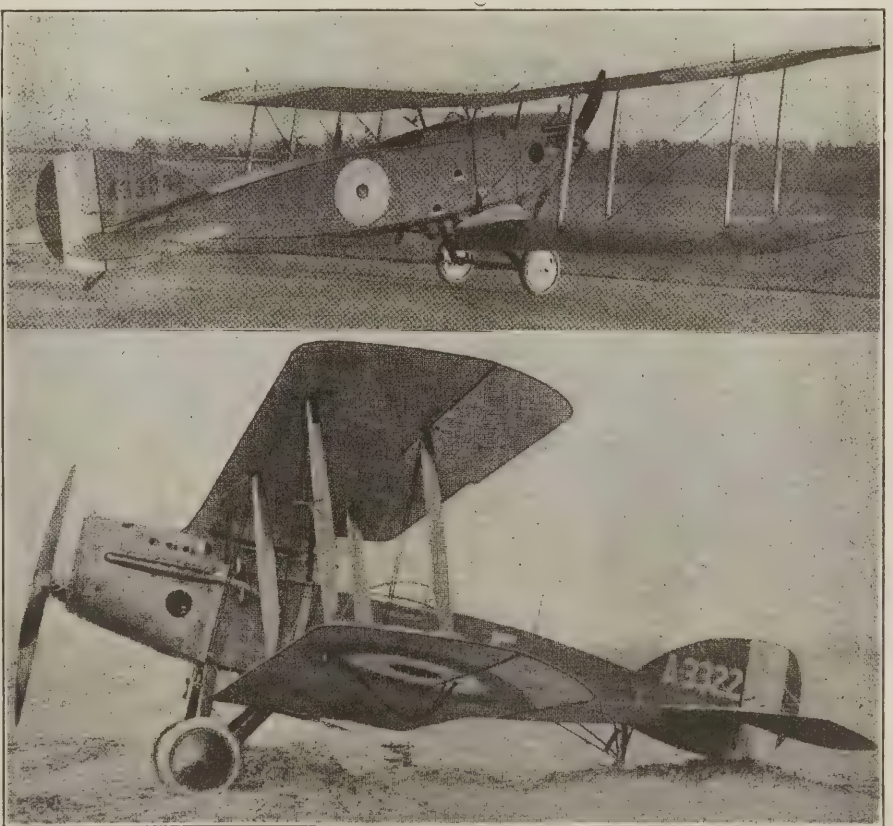
M

Marshall, Robert J	FRF
Mueller, Paul M	FRF
Mahoney, James P	FRF
Molter, Bennett A	RSD
Martin, Howard C	DIK
Mitchell, Raymond A	DIK
Meehem, Timothy E	DIK
Meyers, Harold	DIK
Moffat, Reuben C	DIK
Monteith, Charles N	TMA
Martin, Charles Adams	SLR
McCabe, Edward Lawrence	SLR
Menke, Thomas Henry	SLR
Means, James F	SLR
Mathewson, George T	SLR
Merten, Elmer Le Roy	SLR
Miller, Johnston Oliver	SLR
Miller, Dewey Harold	SLR
Mitchell, Leonard C	SLR
Mumford, William Clinton, Jr	SLR
Manson, Joel L	SLR
McClellan, George Abraham	SLR
McFadden, James Edward	SLR
McIlvaine, Arthur Dawson	SLR
Murphy, George T	SLR
Meservey, Elmer Robson	SLR
Miller, Rolfe Thoburn	SLR
Montgomery, Caleb Eugene, Jr	SLR
Moye, Frank Langdon	SLR
McDaniel, Harry H	CSO
Marcus, Herbert	CSO
Miller, Walter	FRF
Mills, Herbert H	FRF
McMillan, Gail H	FRF
Mayfield, Charles R	LHV
McGinness, Blake R	FRF
McArthur, Emmett K	FRF
McLafferty, Joel E	FRF
MacLaughlin, Thomas G	FRF
McLaughlin, Oscar F	FRF
Moore, Julian E	FLR
Morris, David R	FLR
Mahoney, James P	FRF

Testing out a 120 H.P. le Rhone motor on a 15 meter Nieuport type 23. (French Official Photo.)

Marshall, Robert J	FRF
Marvin, William G	PWM
McCracken, Otho	FRF
McEwen, Robert R	FRF
Murphy, Maurice H	FRF
Martin, Howard C	FRF
MacLeod, George C	OSU
Matthews, Robert Harry	SLR; EOT
Miller, Wesley Albert	SLR; EOT
Moon, Lawrence Bartelle	SLR; EOT
Moore, Marlin Clarkson	SLR; KST (2)
McBride, Walter John	SLR; RSD
Mason, Ernest J	PFO
Morehead, Joseph H	PFO
Meyer, Walter W	FRF
Mead, Lynn D	SLR
Moffat, Reuben C	FRF
Moser, Harry Vreeland	SLR; LDT
Maxwell, William Calvin	SLR; KST
Monteith, Darrel McDermott	SLR; RSD
Miller, Julian Francis	SLR; LDT
Marshall, Richard Horatio	SLR; KST (2)
Maloney, John P	SLR
McHenry, Arthur J	FRF
McDuffee, William S	ELA
Miller, Clarence L	CSO
Mayer, William	FRF
Morris, John Paul	SLR; EOT
Muller, Auguste Frederic, Jr	SLR; EOT
McLaughlin, John Gerard	SLR; EOT
McKenzie, Wesley Raymond	SLR; LDT
McGregor, Howard C	KST
McReynolds, Finis E	SLR
Matter, Milton	SLR
Merrell, Cyrus W	FRF
Mitchell, Raymond A	FRF
Meyer, Bert P	FRF
McDaniel, Hubert L	Note; 18
McHenry, Harold I	Note 19; WCS
Munford, Edward S	FRF
McGurk, John S	Note 2
Moore, Edward S	Note; 15; WCS
Montgomery, Caleb Eugene, Jr	SLR; CWT
Murhpy, George Thomas	SLR; SMM
Matthewson, George Turvey	SLR; DIK
Merten, Elmer LeRoy	SLR; DIK
Mumford, William Clinton, Jr	SLR; DIK
Mack, Donald L	FRF
Mahon, Rennie J	FRF
Miller, Johnston Oliver	SLR; WAC
McClellan, George Abraham	SLR; CRI
Miller, Rolfe Thoburn	SLR; RSD
McFadden, James Edward	SLR; CAF

(*Continued on page* 460)



The Bristol Fighting 2-seater, with a gun ring at the back. Built by the British and Colonial Aeroplane Company. The illustration above shows a slightly different engine cowling from the one below. (Courtesy of the "Aeroplane")

FOREIGN NEWS

DENMARK

The Danish Aeronautical Society is preparing for aerial mail services, which they hope will be carried into effect at the close of the war. Negotiations are pending with thirty-nine municipalities in the matter of constructing landing stations, including hangars 1,300 feet square. Routes from Copehagen to Odense, Frederica and Esbjerg, from Copenhagen to Kallundorg and Aarhus and from Copenhagen to Aalborg have been mapped out, and a route from the Danish capital to Gothenburg and Christiana are also planned.

FRANCE

The official war office announcement of April 29th reports the following aerial activity:

"Two enemy aeroplanes were brought down on April 27th. The same day our bombing 'planes dropped 6,000 kilos of projectiles on establishments in the enemy zone.

According to the announcement of May 1st, Sub-lieutenant Guerin brought down his twentieth enemy airman on April 30th. Sixteen of these have been brought down since December 1st, 1917.

Reporting on aerial activity, the French official communication of May 3rd states:

"Eight German aeroplanes were brought down on May 2, and twelve others, gravely damaged, fell behind their lines during a series of combats with our aviators. Effectual aerial bombardments were carried out during the day and night of May 2, 27,000 kilograms of projectiles being dropped on the railway stations at Ham, Nesales, Royes, Chaulnes and St. Quentin and upon bivouacs and cantonments in these regions. Seven thousand kilograms of bombs were dropped on enemy establishments in the region of Rethel and upon the railroad station at Asfeld-le-Ville."

The German aeroplane which was captured at Meaux, France, which had lost its way when attempting a raid on Paris, is a biplane of the A. E. G. type, fitted with two 260 horsepower engines, giving a maximum speed of 90 miles an hour. The pilot, through some miscalculation, thought himself over his own lines. He burned a flare, which was answered by one of the same color below. Upon seeing this, he landed his machine and its three occupants set out to ascertain their whereabouts. Soon they found themselves surrounded by a group of foresters and soldiers, who were guarding prisoners.

Reporting on the Macedonian situation, the Allied official statement issued from Paris on May 1st says:

"Numerous bombardments were carried out by Allied aviators. Two enemy aeroplanes were brought down."

On May 2nd, the following announcement regarding aerial activity on the Balkan front was issued:

"British aviators bombed the enemy's back areas. An enemy machine was brought down south of Gievgeli by a French aviator."

GREAT BRITAIN

The official announcement on aerial operations issued on April 30th says:

"East of Locre the enemy's troops on Monday (April 29th) offered good targets to our pilots, who dropped 275 bombs on them, and engaged them with machine gun fire.

"Seven hostile machines were brought down in air fighting, and one was shot down by our infantry. Two of our machines are missing."

Despite unfavorable weather conditions, the following aerial operations were announced on May 1st:

"Mist and rain again prevented flying Tuesday (April 30th), except for a few low reconnaissances in the course of which bombs were dropped on the enemy's troops between Locre and Voormezelle.

"One hostile machine was forced to land behind our lines. One of ours is missing."

The report on aerial operations issued on May 2nd says:

"One ton of bombs was dropped today at Thionville. Several bursts were observed on the barracks, railway stations and sidings. A fire broke out in the Carkshutte works."

More than fifteen tons of bombs were dropped by British aircraft at or upon the disabled Turkish cruiser, formerly the Goeben, which was taken over from the German Navy, while she lay aground at Navara Point, in the Dardanelles last January. Eight or ten aeroplanes were continually in action and two hundred and seventy-five aeroplane flights were made in an attempt to complete the destruction of the ship. On January 29th, a British scout machine sighted the Goeben in the Arsenal Dry Docks, at Constantinople.

The British official announcement of May 3rd reports intensive aerial activity, despite unfavorable weather conditions, as follows:

"A thick haze Thursday interfered with the work of our aeroplanes. Three and a half tons of bombs were dropped on Bapaume and other targets in the battle areas. At times the fighting in the air was severe.

"Fourteen hostile machines were downed and four were driven down out of control. Five of ours are missing.

"During the night five and a half tons of bombs were dropped on Chaulnes, Juniville, the railway junction at Bapaume and at Caix. Three very large bombs were also dropped from a low height on the lock gates at Zeebrugge.

"Friday another successful raid was carried out against the railway station and sidings at Thionville. The Carlschutte works again were hit and several bursts were seen on the station, sidings and gas works. All our machines returned."

The British official statement issued on May 4th reports the following aerial operations:

"A most successful day's work was accomplished by our aeroplanes Friday, good visibility assisting co-operation with the artillery. Bombing was carried out with the utmost vigor. Over twenty tons of bombs were dropped on the Chaulnes, Tournai and La Bassee railway stations and on Estaires, Marcelcave, Menia, Comines and Middlekerke.

"Fierce fighting continued all day. Twenty-eight German machines were brought down, five were driven down out of control and three were shot down by anti-aircraft guns inside our lines. Eleven of our machines are missing.

"After dark a thick mist set in on most parts of the front. Over two tons of bombs were dropped, however, on the Chaulnes and Juniville railway junctions. In spote of the very bad weather, all our machines returned."

An Associated Press dispatch, dated May 4th, reports from Dutch sources some of the results of the persistent Allied air raids. According to *Les Nouvelles* of The Hague, Allied aviators recently sank in one day twenty-one Belgian boats, laden with gravel and road metal for the German front at Picardy. Two arches of the Namur bridge were destroyed several weeks ago. Roads have been cut up so that the Germans have experienced great difficulty in bringing up sufficient gravel and stones to fill up the craters. From the same source, it is stated that Allied aircraft destroyed the railway station at Hainaut, Belgium, resulting in the destruction of a forty car train of munitions and the loss of many Germans.

An Associated Press cable reports several attacks on Dutch fishnig vessels by German seaplanes.

Captain Stanley Rosevear, Canadian aviator in the Royal Flying Corps, was killed in action on April 25th. He was one of Canada's foremost aviators, having brought down twenty-one German airmen single-handed. His record included three scores a day on two occasions and ten scores in eleven consecutive days. He had been awarded the D. S. O. with bar.

The Victoria Cross has been awarded to Lieutenants Allan Gerrard and Alan Arnett McLeod of the Royal Air Force for their remarkable feats of airmanship. Gerrard, when on an offensive patrol with two other officers, attacked five enemy aeroplanes, shooting one down in flames. He then attacked an enemy aerodrome, engaging single-handed some nineteen machines, which either were landing or starting off, and crashed one of them against the aerodrome. Seeing one of his companions in difficulty, Gerrard went to his assistance, and downed a third enemy. Finally, overwhelmed by number, Gerrard was forced to retreat.

McLeod, while flying at an altitude of 5,000 feet was attacked by 8 enemy machines. By skilful manoeuvres, , he was able to shoot down three of his opponents. Both his observer and McLeod were wounded by the enemy, and their machine was in flames, but McLeod returned safely to his own lines.

Educational lectures on aircraft topics are being given in London, Leeds, Lincoln, Coventry, Norwich and Peterborough under the auspices of the Aeronautical Society of Great Britain. The subjects of the lectures and the lecturers are: "History and Development of the Aeroplane," by Captain F. M. Green; "The Aerofoil and Fluid Flow Round Bodies," by E. F. Reis; "The Air Screw," by A. Fage; "The Modern Aeroplane," by F. H. Branwell; "Materials and Methods of Design in Construction of Aeroplanes," by J. D. North; "Industry and Development of Baloons and Airships," by Commander W. Lockwood Marsh; "Constructional Methods, Airships and Balloons," by Wing Commander J. N. Fletcher; "Stability and Control," by Captain R. F. C. Aston; "Airships," by Captain J. S. Irving; "Meteorology and Navigation," by Professor W. G. Duffield.

According to an article in one of the London papers, experiments are being made to produce the planes of flying machines from aluminum wire mesh fabric, filled with a cellulose acetate film.

During April, 585 aeroplanes were reported downed on all battlefronts. This was somewhat more than half of the total in March, which was 1,059, the highest aggregate during the war. Of the total of 585, the Allies claimed 470 and the enemy 115. More than half of the Allies' total, 278, fell to the guns of British pilots, infantry or anti-aircraft guns. Against this, 75 British machines were lost, 172 German aeroplanes were downed, 22 fell to gunfire, and one large bombing machine was captured intact. Although these totals indicate less activity than the previous month, on April 12th, 40 German machines were destroyed by British pilots, 20 driven down out of control, and 2 destroyed by anti-aircraft artillery, making a loss on that day to the enemy of 62 machines.

ITALY

The War Office at Rome included the following statements regarding aerial activity in the announcement of May 2nd:

"Italian aviators brought down three enemy aeroplanes. British airmen brought down two others."

"Greater aerial activity than usual is indicated by the official Italian announcement of May 3rd, which states:

"On the whole front there was intense aircraft activity. Eight hostile machines are reported to have been destroyed."

A more complete description of the operations of May 3rd is contained in the night report, which supplements the above:

"Our flyers destroyed twelve enemy aeroplanes. We lost three machines. The total number of enemy aeroplanes destroyed since the arrival of the British in Italy is 109. In the same period we lost 13."

On May 4th, the Italian War Office issued the following statement regarding aerial operations:

"Aircraft actions were carried out despite the enemy's attempt to oppose them. The British dropped sixty bombs on hutments in the Assa valley. An Italian airship dropped a ton of explosives on the aviation ground at Camp Maggiore. Fourteen hostile aviators were brought down."

Increasingly intensive aerial operations are described in the War Office statement issued from Rome on May 5th:

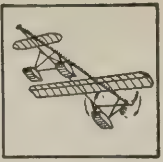
"The activity of our aircraft has been intense. Caproni flights and British aeroplane, protected by numbers of chasers, dropped about nine tons of bombs on the hydro-electric works at Cavedin, north of Mori. While this operation was in progress other machines renewed the bombing of the aviation ground at Campo, Maggiore, south of Lenico.

"Last night our airships, reaching by surprise the railway station at Primolano and Bolzano, dropped their loads of bombs with good effect. At the same time an airship of the Royal Navy engaged enemy columns on the march beyond the Tagliamento.

"Eight enemy machines were reported destroyed, two of which fell in flames within our lines."

MODEL NEWS

Edited by John F. McMahon



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MODEL AERO CLUB OF OXFORD
Oxford, Pa.

IN making my acquaintance with the readers of this page, I want it to be understood that in future "MODEL NEWS" will contain instructions for building models and model motors, in addition to the usual notes of model contests, photographs of new models and general information.

Starting with the next issue of this paper, I will begin a series of articles on the construction of model aeroplanes, starting with the simplest of rubber driven models, and with each succeeding issue, gradually work up to the construction of engine driven models. When we think we have mastered the full scale, engine driven model, we will go a step further to the man carrying glider, and thence to the light horse powered man carrying machine.

Some model makers have an idea that in order to construct an engine driven model it is necessary to have a fully equipped machine shop. I wish to correct this impression at once. It is only necessary to have a file, good drill press, a small riveting hammer, alcohol lamp and a good vise. (When we get to making engines, I will give instructions in adopting the tools I have just mentioned to different kinds of machine tools, such as a hand lathe, metal spinner, grinder, etc.)

In order not to hold back the more experienced model flyer while the simpler models are being described, I will have articles interesting to him as well. Before the end of the year, I hope to have all the model readers constructing engine driven models, or the large machines. It was through the model aeroplanes made by Prof. Langley and the Wright Brothers, that aviation became a reality, who knows, but some of our readers, through experiments with models of their own construction will, by chance, hit upon something that will revolutionize the whole aeroplane industry. I might call attention to the fact, that all the old model flyers have benefitted by their experiments with models, inasmuch as most of them are holding responsible positions with large aeroplane companies, or have received commissions in the service. If I were to list the names of all the model flyers who have made good, this page would not be large enough to hold them. Each and everyone of you have the same chance. The model flyers of today are the big aircraft men of tomorrow. If at any time you have difficulty with your models in the way of constructing, balancing, or something you cannot overcome, or if you have any suggestions to be made, don't be a bit backward in sending ideas to me. If you have any photographs of successful models that you think others would like to see, please send them to me with full description for publication.

MODEL EDITOR.

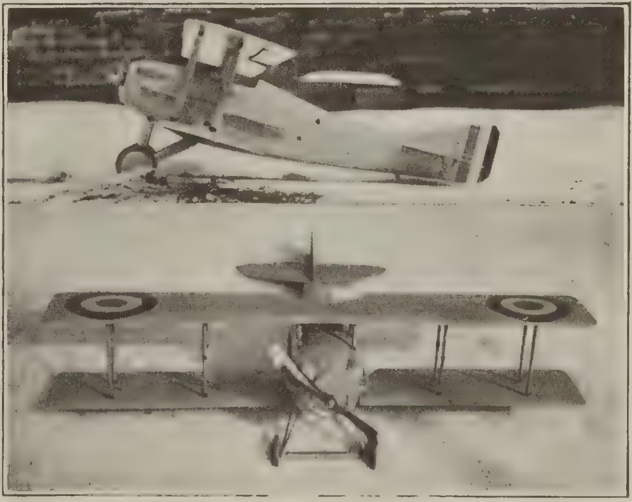
Interesting "Spad" Model Made of Wood

The Spad model shown in the accompanying illustrations is made of wood, and true to scale, being one inch to the foot. It is finely constructed and when placed on exhibition attracts a good deal of attention. It is very scrappy in appearance and has a miniature Lewis machine gun mounted on the fuselage immediately in front of the pilot. For those who care to construct a model of this kind the directions are as follows: The body is made from a piece of soft white wood free from knots and after marking out the general outline of the fuselage (the streamliners behind the pilot's head and over the engine cylinders can be made separately and glued on later, then shaped to fit), shape roughly with sharp knife or chisel after which it may be planed and sandpapered. The pilot's cockpit is just a hole 2" in diameter, a seat may be inserted. This can be made from cardboard and painted to represent aluminum, a large upholstery tack may then be placed behind the pilot's head about the centre of the streamliner.

The wings are made from ¼-inch white wood, after shaping to a perfect wing section (the Spad being a fast machine the bottom may be left flat, only the top being cambered), then drill 3/16" holes at points where struts are to be connected. Struts are made of ¼-inch dowel sticks but planed and sandpapered to a perfect stream line shape. The struts for the landing chassis are cut from white wood on account of the thickness and are made in one piece, a ⅛-inch hole being drilled through each at the apex of the V's for the axle. A streamliner of wood is made around the axle; the wheels are alinum disc 2" in diameter.

The rudder, fin, tailplane and elevators are made of ⅛" wood. The entering edges are rounded off with sandpaper, the trailing edges are shaped more to a knife edge. The exhaust pipes on this model are made of copper tubing, but they may be made of reed ¼" diameter.

To assemble, drill holes in the fueslage for top plane struts, and glue struts in place, next glue top plane in place. When glue is set turn model on its back and glue the bottom plane in place, butting it against fuselage. To make this joint stronger a metal clip should be nailed to bottom plane and fuselage. The rudder, fin, and tail are glued and nailed in place. The landing carriage is next placed in position by glueing the struts in holes drilled in bottom of fuselage. As no wires run to the elevators or rudder on the Spad this makes a very clean job. Before wiring between the planes it would be better to paint the machine as it is much harder to do this after wires are in place. The machine should be painted a silver grey or sky blue. Black paint should be used to represent fittings. To make the model look more like its prototype, paint the French insignia blue, white and red circles on the planes, and stripes on the rudder.



Two views of a Spad scale model as described above

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Are You Insured?

Are you insured? It's really a vital question,
If not, you should be, but 'tis only our suggestion.
For if you ride to work each day upon our yellow cars
By this time you must be well nigh full of scars.

Some mornings back the steering broke, oh yes, we came off well,
But another time we might not, for never can we tell,
Of course this won't occur again, for they've tied it up with wire,
And if you say that's not much good, they promptly call you l—r.

Another day a wall we cannoned, such an awful knock,
The men just did a shudder, but the ladies got "some" shock.
O'er stones and mud we lumbered till the Works they hove in sight,
But it took us nearly all that day to recover from the fright.

Not long ago, while riding with the 'bus in concert pitch,
An "Indian" o'ertook us, then we all went in the ditch,
So out again we clambered with sundry cries and groans,
And set off to the Works on foot, in spite of bruised bones.

Now don't you think it would be wise before things get much worse,
In case some day, after a spill, you go home in a hearse,
Don't think we wish to make you sad, yet knowing not our fate,
We suggest, get insured for a good round sum before it is too late.
"ISO."

Guaranteed!

Novice: "Suppose when I get up two thousand feet in the air this monoplane suddenly falls."

Salesman: "We warrant all our goods. You can bring it back."—*Lehigh Burr.*

Good Advice

He who courts
And does not wed,
Often goes
To court instead.
—*Penn State Froth.*

Back from the Front

"Rastus, is my bath warm?"

"Yassah, the warmest Ah was evah in."—*Harvard Lampoon.*

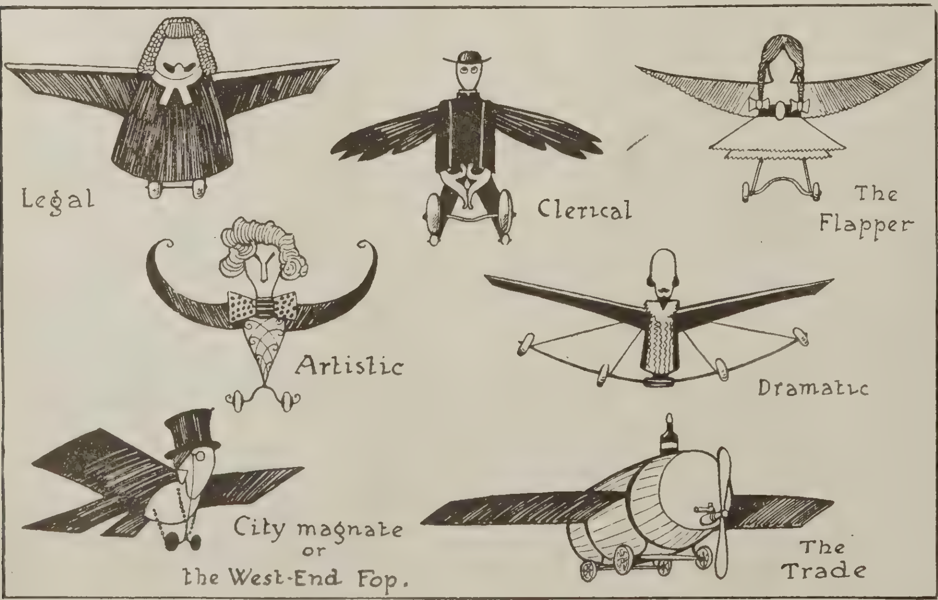
That's It

Visitor: "I don't see how the airmen can keep their little caps on their heads."

Instructor: "Vacuum pressure."

To the Latin Department

Giveit tu em gudant plenti,
Soc et tu em gudant strong,
Never letem geta stand in,
Gopher evri word that's wrong.
Makem flunk and makem worry,
Makem sit up nights and buck,
Makem wun derwat cher thinking,
Makem cursther evilluck.
Never letem getoo hopefull,
Never sayther doing well,
Makem wish they hadn't cum here,
Makem wishu were—at home.



A few suggestions for manufacturers' after-war designs, to suit all sorts and conditions of sporting followers of the art of aviation.

Gillette Safety Razor

Have You Seen the New Gillettes Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

Hundreds of officers and men are buying them—the U. S. Service Set in metal case, and the new Khaki-covered sets for Uncle Sam's soldiers and officers.

The Gillette is the one razor for the man who is doing things—the one razor with world-wide use and reputation.

When a man wants new Blades he can get them at any Post Exchange or Y. M. C. A. Hut—here in America or Overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

The Gillette Is the Real "Once-Over Razor" of the Fighting Man

THE Gillette Safety Razor has been carried in the breast pockets and in the kits and ditty boxes of hundreds of thousands of keen, alert fighting men on every front and on every sea.

It's made good—under conditions that have sent nearly every other kind of razor into the rubbish heap.

The Gillette is bringing shaving comfort to thousands of men in the Service—no matter how wind-tanned and sun-burned.

Every man in the Service—or every man who's going Overseas—needs a Gillette. The new U. S. Regulations require the boys to keep clean-shaved.

The Gillette makes it easy. It delivers a velvet-smooth shave with any thickness of beard or skin, with hard or soft or hot or cold water. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing.

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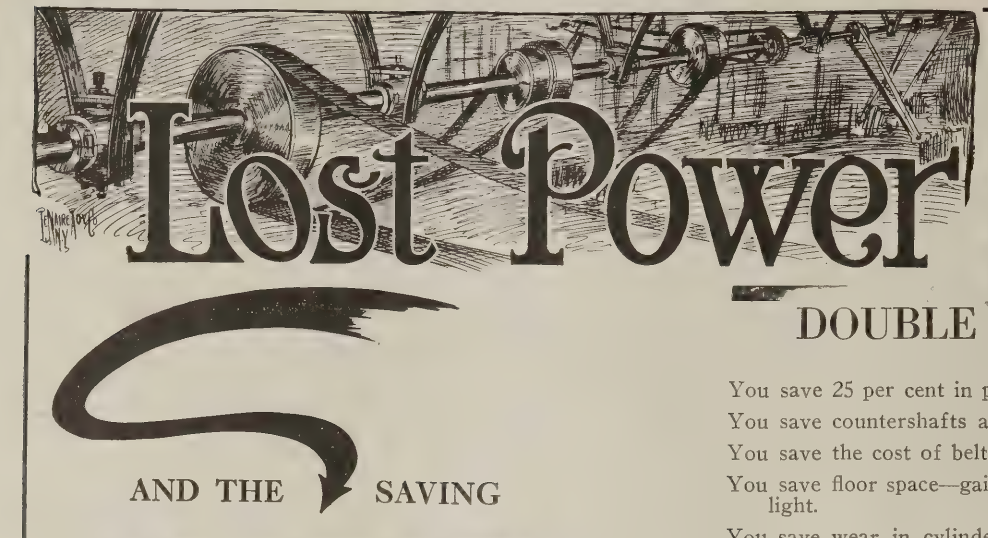

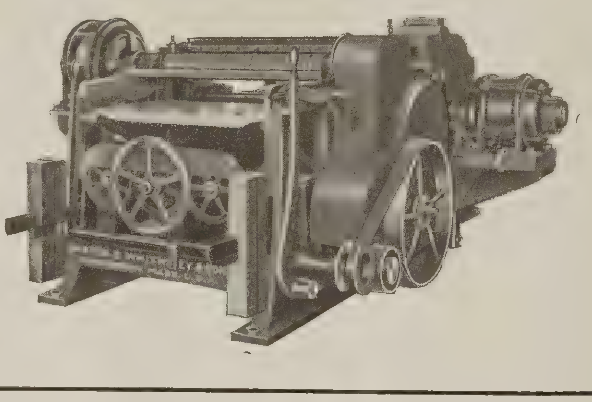

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(*Continued from page* 455)

Manson, Joel Lincoln	SLR; SBI
Montgomery, Caleb E	DIK
McCabe, Edward L	DIK
Meservey, Elmer Robson	SLR; FOB
Menke, Thomas Henry	SLR; CWT
McCabe, Edward Lawrence	SLR; CWT
Mackenzie, William N	HHN
Merrill, Charles E	KST
Meagher, Joseph E	FRF
Morrison, William R	KST
Mapes, Donald. D	DIK
McCrossen, James F	DIK
Miller, Ivan C	DIK

N

Niedermeyer, Frederick W., Jr	TMA
Nichols, Luthur Allen	SLR
Norton, Howard Browne	SLR
Nelson, Ernest B	SLR
Nelson, Theodore E	FRF
Nolker, Herman W	FRF
Nelly, James T	FRF
Noble, Arthur Garfield	SLR
Nowlen, Stanley	DIK
Nelson, Fred C	TFT
Nolan, Charles Lincoln Vincent	SLR; KST (2)
Neeley, Forest H	FRF
Nelson, Ernest Bruce	SLR; WAC
Noble, Arthur Garfield	SLR; SBI
Norton, Howard Browne	SLR; RWT
Nichols, Luther Allen	SLR; RSD

O

Osborne, Leonard W	CPR
Oribson, William F	WFO
O'Dowda, John Stephen	SLR
Olds, Harvey Richards	SLR
O'Malley, Joseph J	SLR
O'Neill, Charles	SLR
Oaks, John Clark	SLR
Ott, Ralph Titus	SLR
Ordway, Lloyd Hayden	SLR
Owen, Hubert K	FRF
O'Connor, Nicolas E	CSO
Olsen, Eugene F	TFT
O'Connell, Robert Everett	SLR; RSD
O'Brien, Martin Jeremiah	SLR; KST
O'Neill, Ralph Ambrose	SLR; TFT (1)
Organ, Vernon C	FRF
O'Dea, Bernard J	CSO
Oakes, Gail C	PFO
O'Fallon, William G	Note 10
O'Dowda, John Stephen	SLR; GLC
Ordway, Lloyd Haydn	SLR; HHN
Oakes, John Clark	SLR; FOB
Olds, Harvey Richards	SLR; RSD
Ott, Ralph Titus	SLR; CJW
O'Malley, Joseph John	SLR; DIK
Olson, Charles W., Jr	FRF

P

Pelot, Marion E	RWT
Pascoe, William H	DIK
Palmer, Walter	DIK
Pond, Richard E	DIK
Parrish, Thaddeus Rowland	CPR
Philbrook, Jacob B	DIK
Prescott, Richard D	MJR
Politoske, Edward John	SLR
Plummer, William LeRoy	SLR
Parmenter, Lewis E	SLR
Peace, Robert G	SLR
Peteler, Roland O	SLR
Peterson, Orrin Peter	SLR
Purdy, Glenn Theodore	SLR
Pottle, Vincent F	WFO
Penny, Albert D	FRF
Philbrook, Philip E	FRF
Peinze, Carl E	FRF
Polk, George W	TFT
Parkhurst, Amos J	FRF
Pratt, Clifford V	FRF
Pitts, Younger Arnold	SLR; RSD
Parks, Ralph Osborn	SLR; LDT
Price, Owen Newton	SLR; DIK
Pence, Ferris Edwin	SLR; EOT
Patterson, Robert E	PFO
Phillips, Donald B	PFO
Pardee, Max Asher	SLR; DIK
Penick, John N	SLR
Pyke, Robert West	SLR; RSD
Pinney, Edwin R	
Peteler, Roland Owen	SLR; Note 7
Peterson, Orrin Peter	SLR; RII
Patten, Ryder	Note 9
Peace, Robert Garfield	SLR; VBW
Parmenter, Lewis Edmund	SLR; WAC
Platt, Livingston	WAC
Purdy, Glenn Theodore	SLR; BST
Plummer, William LeRoy	SLR; GLC

Q

Quirk, John H	WAC
Quinn, Frank J	SLR

R

Roby, Townsley N	DIK
Robinson, Clark	DIK
Ray, Paul M	DIK
Ristig, William B	DIK
Royce, Walker W	DIK
Rector, Van Buren	CPR
Rankin, George V	RWT
Ransome, Philip Gordon	SLR
Reisz, George S	SLR
Riggs, Robert Milton	SLR
Robinson, Ward Fisk	SLR
Rough, Howard F	SLR
Reese, Edward Kent	SLR
Reichardt, Fred Osmor	SLR
Reilly, Joseph Bernard	SLR
Rowe, Robert Barrett	SLR
Ramsey, James N	FRF
Riggs, Edward M	SLR
Rile, Atlee Disston	SLR
Roberts, Emerson B	SLR
Reasoner, Nathan R	FRF
Rahn, John C	FRF
Redman, Mark H	MSC
Ridgely, Arthur O	FRF
Robinson, Edward A	PWM
Ratliffe, George Thomas	SLR; CWT; FRF
Ross, Harry Shelmire	SLR; CWT
Robertson, Charles Blackford, Jr	SLR; DIK
Ranson, John Williams	SLR; LDT
Roe, James Aloysius, Jr	SLR; LDT
Riddlesbarger, Rufus	SLR; EOT
Roberts, George Lewis	SLR; LDT
Rose, Joseph Walter	SLR; RSD
Rogers, Emery Herman	SLR; CWT
Rodenhurst, Edward Percy	SLR; KST
Riddick, Roland Carlos	SLR; RSD
Roberts, Francis Murray	SLR; KST
Reed, John Henry	SLR; KST
Rundbaken, Frederick J	PFO
Riggs, Robert M	PFO
Royer, James A	PFO
Ramsey, James N	FRF
Roby, Townsley N	FRF

R

Roberts, Emerson Bryan	SLR; Note 7
Robinson, Ward Fisk	SLR; CWT
Riggs, Edward Murray	SLR; PFO
Reilly, Joseph Bernard	SLR; SAG
Reese, Edward Kent	SLR; ELA
Ransone, Philip Gordon	SLR; CWT
Riggs, Robert Milton	SLR; DIK
Rough, Howard Fanning	SLR; RSD
Robinson, Hyman I	SBI
Rowe, Robert Barrett	SLR; LDT

S

Simpson, Lawrence G	FRF
Sultan, Walter D	PWM
Sneed, Albert L	RSD
Schanck, Roland M	DIK
Sheffield, Frank H	DIK
Silcott, Arthur E	DIK
Stock, Hugo L	DIK
Slonaker, Clyde C	RWT
Sloan, Samuel A	DIK
Sullivan, Henry B	DIK

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Wasson, Roy J.	DIK
Watson, Harold S.	DIK
Wells, Roe E.	DIK
Wendlandt, Paul	RWT
Watson, William	FRF
Westphal, Victor B.	LHV
Winter, William	CSO
Whitman, Roger B.	CSO
Wood, Campbell	LHV
Walsh, William Douglas	SLR
Wascher, Frank E.	SLR
Warren, Edward William	SLR
Warner, Stephen Reed	SLR
Weightman, John Aldon	SLR
Wentworth, Harold S.	SLR
Wood, Edward Huffner	SLR
Watson, Leo Clyde	SLR
Weaver, Edgar Royden	SLR
Webb, Curtis Christopher	SLR
Williams, William Cyril	SLR
Williams, William J.	SLR
Wood, Seth F. A.	SLR
Wallis, Harry T.	SLR
Whaling, Heiskell B.	SLR
Whitney, William Elliott	SLR
Wolterding, Gerhard C.	SLR
Woeling, Kenneth Kaarta	SLR
Wright, Burrell	SLR
Wright, Merton L.	FRF
Welsh, Miles E.	FRF
Wylie, Lawrence	MSC
Worrall, Joseph A.	GLC
Wing, Claud E.	PWM
Willets, Ernest F.	CSO
West, William Ward	SLR; EOT
Whiting, Brian Fairfax	SLR; EOT
Williams, Isaac Jackman	SLR; EOT
Winterton, Roland John	SLR; EOT
Wyman, Wallace	SLR; KST
Wood, Horace Walter, Jr.	SLR; KST
Wilcox, James Wilson	SLR; DIK
White, Chester Morton	SLR; KST
Walton, Charles William	SLR; CWT
Wortley, Franklin	SLR; KST (2)
Whitty, Henry Raymond	SLR
Wettlaufer, Ralph Cecil	SLR; KST
Wagner, Parker	SLR; GLC
White, Joseph Talbert	SLR; LDT
Wait, Harry Wallace	SLR; DIK
Whitfield, Raoul Falconia	SLR; KST
Wherell, Albert Joseph	SLR; EOT
Welch, Paul Rizor	SLR; RSD
Washburn, George Henry	SLR; DIK
Watson, William	SLR; EOT
Walker, Stephen Pillsbury	SLR; KST
Wright, Putney L.	FRF
White, Roy W.	FRF
Winkle, William Edwin	SLR; DIK
Wahle, Chester Davis	SLR; RSD
Walsh, Edward S.	SLR
Wachob, Frank A.	FRF
Wahle, Chester D.	PFO
Welch, Paul R.	PFO
Wheeler, James R.	PFO
Wallace, Glenn E.	FRF
Weisbach, Arthur H.	FRF
Whitecarver, James F.	FRF
Wright, Stanley V.	FRF
Westaby, Clarence R.	FRF
Walsh, William Douglas	SLR; DIK
Wascher, Frank Earl	SLR; KST
Wood, Seth Frederick Alexander	SLR; HHN
Wood, Edward Huffner	SLR; DIK
Warner, Stephen Reed	SLR; CWT
Weightman, John Aldon	SLR; KST
Warren, Edward Willard	SLR; KST
Wachob, Frank Alonzo	SLR; CJW
Webb, Curtis Christopher	SLR; EOT
Williams, William Cyril	SLR; RWT
Weaver, Edgar Royden	SLR; CAF
Whitney, Reginald W.	WFO
Watted, Carl F.	DIK
Wood, Normand R.	DIK
Woods, Palmer P.	DIK
Warner, Frederick H., Jr.	WAC
Willard, John	WAC
Whitney, William Elliott	SLR; DIK
Weeks, Harold H.	REL; OSU
Walser, Arthur C.	Note 5
Watson, Leo Clyde	SLR; TMA
Wilson, Ralph W.	Note; 14
Wolterding, Gerhard Christian	SLR; VBW
Whaling, Heiskell Bryan	SLR; VBW
Williams, Sanford E.	FRF
Wilbourn, Arthur E.	Note 9
Williams, William Jewell	SLR; PFO
Wohler, Chester B.	FRF
Whitaker, Frederic S.	FRF
Whitaker, Henry A.	RTR
Williams, Verle E.	TFT
Wade, Don D.	KST
Warner, Donald A.	FRF

Z

Ziegler, Rennie Lloyd	SLR
Zwetow, Arthur Nathaniel	SLR

(*Continued from page* 441)

unless an allowance is made to officers, when they will be expected to get khaki uniform as soon as possible.

The cap will be of the same pattern as that worn by the R. N. A. S. The crown is khaki, and the peak and band are black. The badge is entwined laurel leaves, above which is a reduced fac-simile of the metal bird at present worn on the sleeve by the R. N. A. S., the whole being surmounted by a crown. Rank is denoted as follows:

Second lieutenants and lieutenants, one upright metal bar on each side of the badge.

Captains, two upright metal bars on each side.

Field officers, one row of gold oak leaves on the peak.

General officers, two rows of gold oak leaves on the peak.

The jacket is that of the military tunic service dress, modified as follows: (a) No shoulder straps; (b) in lieu of Sam Browne belt, a cloth belt is sewn on the back of the coat, which fastens in front with a bright buckle of gilt metal; (c) the buttons are the R. N. A. S. type, *i. e.*, gilt metal with bird surmounted by crown.

RANK DISTINCTION

Officers transferring from the R. N. A. S. and the R. F. C. will, on supplying themselves with Air Force uniform, wear rank distinction corresponding to that which they hold in their present service, whether their present rank is permanent or temporary. The badges of the Royal Navy in khaki braid will be used, with a bird surmounted by a crown, both in gilded metal. Second lieutenants will have no distinction lace, but the bird and crown on both sleeves. Higher ranks will wear distinction lace surmounted by the bird and crown, as follows: Lieutenant, one row; captain, two rows; major, two and one-half rows; lieutenant-colonel, three rows; colonel, four rows. Generals will have lace as follows, surmounted by the bird and crown: Brigadier-general, one broad row of 2¼-inch lace; major-general, one broad row and one ordinary row of distinction lace; lieutenant-general, one broad and two ordinary rows of distinction lace; general, one broad row and three ordinary rows of distinction lace.

Trousers and breeches will be as now worn by the R. F. C., with khaki shirts and collars with black ties. For footgear the following is prescribed: With breeches—Brown field boots or brown boots with puttees or gaiters, or brown stockings with shoes for aerodrome and similar wear. With trousers—Brown boots or shoes with brown socks. The usual military type British arm for mounted services will be worn. Badges of rank will be indicated on the shoulder-strap in the same way as on the jacket, by distinction lace surmounted by bird and crown.

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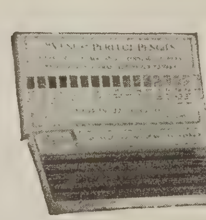

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Fit for Anything

(Editorial in New York *Tribune*)

ANOTHER American, an automobile racer, Rickenbacher, has been added to the list of trained athletes who have distinguished themselves in the air. The list is a long one, but it is no whit longer than that of plain civilians, with no noteworthy record as athletes, who have developed into crack fliers. Guérin, the most promising of the newer French fliers, was a clerk in a Havre shop. So runs the story in every camp and cantonment.

The moral is fairly plain. Athletic prowess is a help, but it is not indispensable. What are absolutely necessary are the sound heart and lungs and nerves which come only from good, husky health, won and preserved by a reasonable attention to bodily needs. Such equipment does not necessarily belong to the crack athlete who has rowed his four-mile races or done his hippodrome stunts. The call that war issues is for sound, all-round physical development—not so much excessive muscular training as good, open-air exercise week by week.

Universal military training would go far to answer this call. So would an increasing sense of national obligation to be strong, to be fit, to be ready for a fight or a frolic. The lesson is one that we can all study and digest for use in the days ahead when we are planning the upbringing of future generations in a world that, however safe for democracy, will never be wholly safe for the defenders of democracy.

(*Continued from page* 451)

Rate of Climb (feet per minute)—						
1432	1232	1060	911	784	674	580
Time (minutes)—						
17.5	20.0	22.5	25.0	27.5	30.0	
Altitude (feet)—						
15485	16645	17640	18500	19240	19870	
Rate of Climb (feet per minute)—						
409	429	369	318	273	235	

Altitude (feet)—					
0	2000	4000	6000	8000	10000
Rate of Climb (feet per minute)—					
1432	1311	1191	1070	950	829
Altitude (feet)—					
12000	14000	16000	18000	20000	
Rate of Climb (feet per minute)—					
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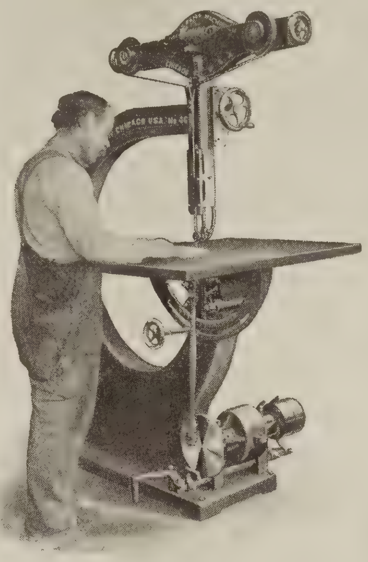

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(*Continued from page* 446)

against the strut. The designer of the machine could affect the design of the jig in many ways. In the case of a wing section in some designs the spars were set at any angle to suit the particular section of the wing which had been chosen, rather than to adjust the section in the vertical plane for both spars. If the designer thought more about the design of the jig when getting out his designs it would simplify the production of the machine to a great extent.

Mr. Gillingham said he had known wood to contract 1-10th inch in 20 ft., and therefore he did not understand how the A.I.D. could expect to get a limit of plus 1 or minus 1. There was a good deal to be said for jigs in certain forms, but wood could not be stopped from shrinking. If the A.I.D. used a little more—should he say practical knowledge—it would facilitate the output of aircraft.

Lieutenant Crossley, R.F.C., said he thought if the foremen in the works and the tool-room foreman worked together more, the jigs obtained would be more effective. Their combined experience would lead to a much better effect. The tool-room drawing office should work more with the shop foremen, and get their experience of faults found in previous tools and jigs.

Mr. Sumner said centralization of design rather assumed finality in aeroplane construction, whereas ideas should be encouraged on the part of sub-contractors and others. The discussion rather took the line that the man who designed aeroplanes could also design jigs, but it required a different training and practice. The tool maker, the constructor of the machine, and the man who was going to use it should all confer, and put all points right at the outset rather than wait till later.

Mr. Alton said he thought most of the aeroplane designers and draughtsmen had come from the automobile industry and tool shops, and knew little of the vagaries of wood, which frequently changed its dimensions 1-10th in. between the woodworking table and the assembling shop. Metal parts were made with tolerances of thousandths of an inch; when used in conjunction with wood they should rather be in tenths of an inch. Metal parts made in thousandths were sometimes sent back for alterations of some tenths to make them fit the wood parts. It was often the faulty design of the metal parts which called for so much alteration in the assembling of the whole machine.

Mr. Winship said, in view of the reduction of the number of skilled hands and the employment of women, cramps would have to be used in jigs with stops to prevent the women cramping the timber up too tightly.

Mr. W. E. John thanked the author for the valuable information he had given that evening. Whilst fully appreciating the value of the use of jigs and fixtures in the manufacture of aeroplanes, he drew attention to a small point in this connection which had not previously been referred to. One of the gentlemen representing the A.I.D. had stated that they advocated the extensive use of jigs and fixtures, since it reduced their work to a large extent owing to the greater accuracy of the parts produced. It must, however, be remembered that jigs and fixtures are generally used by unskilled labor. An unskilled workman operating an inhuman machine, such as a jig, provided with some of the cramping devices shown on the screen that evening, will lack the "feel" possessed by a skilled craftsman and will not realize what harm he may be doing to some parts he is handling. A man working with wood all his life acquires a sense of touch which will warn him at once if by chance a part is over stressed when he is bending it or even when he is placing it in the jig. The part may perhaps possess some invisible flaw. If he is a conscientious workman he will throw such part aside. If, however, he has not had the experience, without realizing there is anything amiss, he will build the part into the machine, and it will take the best inspector all his care to detect the fracture. For this reason, therefore, he wished to point out that with the increasing use of jigs and fixures more attention must be given to the thorough instruction of the operators using such jigs and fixtures.

The Chairman (Sir Henry Fowler) said Mr. Matthews had mentioned that to have a machine jigged properly about 1,200 jigs were required. In the present state of the labor market this was a very serious matter. The time would undoubtedly come when constructing machines on a commercial rather than on a war basis, when what Mr. Matthews had demonstrated would grow to a very large and interesting state, and would be one of the most interesting propositions that had ever come before engineers. There was a difficulty at present in getting sufficient jig makers and draughtsmen.

Mr. R. Borlase Matthews, in reply to the discussion, said that if a factory had a proper jigging system, the jigs succeeding

(*Continued on page* 469)

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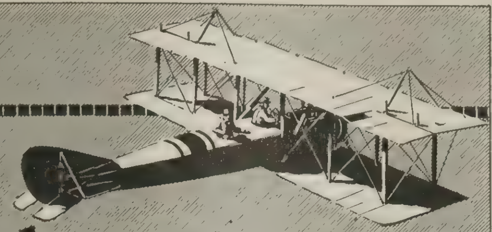

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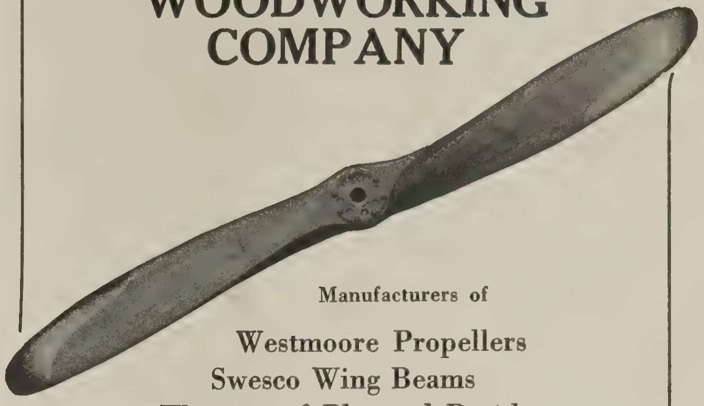

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(*Continued from page* 467)

each other became self-jigs, and if a man strained a piece of wood by forcing it through one jig, the false work would probably be discovered when it was fitted in an assembly unit. He did not think inspectors would be out of work by any means if everybody jigged, as the jigs would have to be inspected from time to time on account of wear. He did not mean to say there should necessarily be one universal jig office. That would be too big a scheme with the present shortage of expert jig draughtsmen. Rather he intended to convey the importance of associating a jig designing office with each firm of aeroplane designers. This jig designing department should supply drawings of jigs for all the aeroplanes designed by the firm to the sub-contractors making each particular machine. The wood-working for aeroplanes had been developed largely by people who had been in the furniture and other wood trades, and they could not be expected to become experts immediately in the aeroplane business. Hence, any assistance that could be rendered in the shape of drawings of jigs should be given, though the designs need not of course be followed in minute detail. Even with the drawings as a basis, there was ample scope for ingenuity and initiative in the construction of the actual jigs. However, at the moment, jig drawings were conspicuous by their absence. He did not intend to despise the skill of the foremen. He meant to say that the main scheme should be laid out on scientific lines before placing the work in the shops, and if the foreman ran short of a special kind of wood or the like, it was up to him to make the necessary modifications, or if he wanted to substitute certain metal fittings for wood, there was no reason why he should not apply the scientific principles that had been laid down. One manufacturer in this country had found it worth while to lay down 5,000 jigs to make one machine, and, as he had pointed out in the paper, the thing was a business proposition.

He knew of a case where the Services decided not to introduce any modifications into a machine, and in a short time they received a couple of hundred modifications from the manufacturer himself. A question to be considered was how long it would be before wood was replaced by metal in aeroplane manufacture.

He had seen vertical jigs for plane manufacture. They were very compact, and constructed entirely of metal.

For wood that had been properly seasoned, either naturally or artificially, he saw no difficulty in fixing limits, and in working to those limits. American and German manufacturers had devoted greater attention to the manufacture of jigs, than had those in this country, although some of our manufacturers moved with the times.

One outstanding feature of the aeroplane industry was that a very large number of difficult problems had been presented, which have had to be most carefully considered. Incidentally, these problems had brought out much ingenuity in their solution. An example, to which reference had been made in the discussion, was the special type of gauge for measuring lengths, devised by the A.I.D.

(*Continued from page* 450)

I fear, unless something of this nature is done, failure in this great department and publicly investigated scandal will result, which, stepping upon the heels of preceding scandals, will accomplish little of a corrective nature—but further delays in this important work.

I believe that you might seize this whole bankrupt program, present the situation to the Senate Military Committee, request abeyance of its investigation, complete what is here begun, and then, under your own guidance, urge the Military Committee to prosecute its inquiry to the end—with your aid and direction.

This has seemed to me to be the constructive plan, to be the harmonious plan, that would result in rebuilding, would give us time to correct the present ills, and with men who desire it we can still deliver some machines in Europe. Sincerely and faithfully.

Gutzon Borglum.

To Hon. Woodrow Wilson, President of the United States of America, the White House, Washington, D. C."

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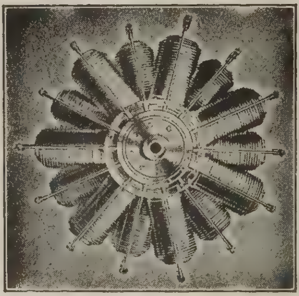

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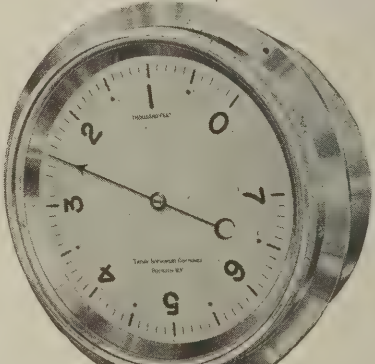

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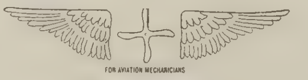

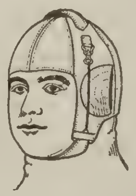

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AERIAL AGE
WEEKLY

Vol. 7, No. 10 MAY 20, 1918 10 CENTS A COPY

THE NEW MERCURY—FACT AND FANCY

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A. S. Burleson, Postmaster-General

Senate and Department of Justice Investigating Aircraft Situation

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Vol. VII NEW YORK, MAY 20, 1918 No. 10

THE FIRST AERIAL MAIL

THE inauguration of the first aerial mail line happens on the very day when Aerial Age is on the presses and we are holding up the printing long enough to include a brief report of this epochal event.

Fortunately, the weather was fine, and everything carried out successfully.

The aeroplanes employed were loaded with mail to their full capacity. Government, state and aeronautic authorities attended the inauguration at New York, Philadelphia and Washington.

The New York party included Postmaster Patten, of New York; Hon. Byron Newton, Collector of the Port of New York, who delivered an address; Mr. Alan R. Hawley, who also delivered an address and Hon. Murray Hulbert, Dock Commissioner; Admiral Fiske, Mr. Glenn H. Curtiss, Henry Woodhouse, Lieutenant Henry Farré, Lieutenant Santiago Campuzano, Lieutenant Dobbel, Professor Charles L. Poor, Mr. William Hawley, Mr. Leroy B. Gulotta, Mrs. Wm. A. Bartlett, Chairman Aviation Committee, National Special Aid Society; Mrs. Henry A. Wise Wood, and Mrs. Charles A. Van Renesselear, vice-chairman and chairman of the National Aeronautic Committee of the Woman's Naval Service, respectively; Miss Alice Carpenter, vice-chairman of the National Committee on Comforts and Recreation; Mr. G. Douglas Wardrop, editor of Aerial Age; Mrs. C. Lansing Baldwin, Mrs. Edward Robinson, Mr. Charles Jerome Edwards; Mr. Evan J. David, business manager of *Flying;* Mr H. B. Childs, and Mr. E. H. Felix.

Mr. Hawley's Speech

In the course of his speech Mr. Hawley said:

"The inauguration of the first aerial mail line is an epochal event, as well as a most important step towards solving certain problems connected with the upbuilding of our aerial forces and meeting a condition which is just beginning to shape itself and which may in a year or two become most serious.

"This day will go down in history as marking the advent of a new epoch, because this New York-Philadelphia-Washington aerial mail line is the forerunner of a network of aerial mail lines which will cover the entire world and will be a dominant factor in the reconstruction that will follow the war.

"Progress in aeronautics in the past eighteen months has been enormous. The marvelous flights of the giant Caproni and Handley Page air cruisers give an idea of what we may expect in the coming twelve months. The flight of one thousand miles without stopping made recently by a squadron of Caproni triplanes, and the flight of a Handley Page biplane from London to the Dardanelles, two thousand miles, with several stops but no mechanical trouble, carrying five passengers and spare parts, complete camping equipment, provisions and bombs, are but some of the hundreds of such performances. These huge warplanes were, indeed, the backbone of the Allied forces in the recent desperate German drive and it is generally stated by the Allied strategists that had the Allies had one thousand more of these huge warplanes they could have prevented the drive. They would have destroyed the bridges on the Rhine and prevented the accumulation of German troops and war materials; they could have attacked troop formation and batteries with bombs and guns, and destroyed munition dumps—and in other ways weakened and harrassed the Germans.

"The tendency is towards large machines—larger and larger. I feel certain that before the year is over we shall see aeroplanes equipped with over 2,000 h.p.—which will be capable of flying across the Atlantic.

"Postmaster General Burleson and Mr. Praeger and the other military and civil authorities who are co-operating in making this aerial mail service a success are to be congratulated for their progressiveness."

In the mail which arrived from Washington, Mr. Hawley received the following letter from Postmaster General Burleson:

May 15, 1918.

MR. ALAN R. HAWLEY,
President, Aero Club of America,
New York City.

My dear Mr. Hawley:

The Aero Club of America naturally will share the pride we all feel in the inauguration today of a permanent aeroplane mail service.

Your efforts in fostering the development of aeronautics in the United States is rewarded by this new achievement.

I anticipate that the aeroplane will be as successful in the service of communication and commerce as it has been in furnishing the eyes and the fighting dart of the sky in the time of war.

The aeroplane mail service should be of great practical value, and it is believed that today marks the beginning of an epoch in the development of a speedy mail communication.

Sincerely yours,
(Signed) A. S. BURLESON.

SENATE AND DEPARTMENT OF JUSTICE INVESTIGATING AIRCRAFT SITUATION

ON May 9th Senator Chamberlain, Chairman of the Military Affairs Committee, put in his resolution to give sanction to the investigation into the aircraft situation. The resolution, which was referred to the Military Affairs Committee, follows:

Resolved, That the Committee on Military Affairs, or any sub-committee thereof, be and is hereby authorized and directed to inquire into and report to the Senate the progress of aircraft production in the United States, or into any other matters relating to the conduct of the war by or through the War Department; that said committee, or any sub-committee thereof, may sit during the sessions, or during any recess of the Senate; to require by subpoena or otherwise, the attendance of witnesses and the production of books, documents, and papers; to take the testimony of witnesses under oath, either orally or by deposition; to obtain documents, papers, and other information from the several departments of the Government, or any bureau thereof; to employ stenographic help, at a cost not to exceed $1 for printed page, to report such testimony as may be taken; to employ such agents or assistants as may be necessary, and that all expenses, including traveling expenses, contracted hereunder shall be paid from the contingent fund of the Senate.

On May 6th, President Wilson, following a period of charges and counter charges regarding the aircraft situation, turned the whole matter over to Attorney-General Gregory, who was instructed to make a thorough investigation of the "wholesale charges" in regard to the production of aircraft made by Gutzon Borglum, the sculptor.

Progress of the Aircraft Discussion Chronologically

May 7

Mr. Borglum's letter of May 6 to the President reiterating his charges and attacking War Department officials for hampering him in his efforts to establish the truth not only caused the Senate committee to determine to pursue its own investigation regardless of the Department of Justice inquiry, but also brought a renewal of the attack on the aircraft program from both sides of the Capitol.

Senator Chamberlain made known the determination of his committee to conduct its own investigation in a fiery speech which stirred the Senate and which was provocative of a debate in which more of the delinquencies and delays were gone over. At the same time W. C. Potter, chief of the equipment division of the Signal Corps, was testifying before the House committee.

Attorney-General Gregory upon leaving the Cabinet meeting declared that his investigation would be an exhaustive one and that he already had the Borglum and the Marshall reports. Assistant Attorney-General Frierson was assigned to conduct the investigation.

"Mr. Borglum," said the Attorney-General, "will have every opportunity to make good his charges. We are not going to investigate the merits of the Liberty motor, but we shall determine whether or not there has been malfeasance such as has been charged."

A contract has recently been cancelled for approximately 5,000 Liberty motors, and the factories assigned to their production will make French motors of the Bugatti and Hispano-Suiza type.

The following facts also were developed at the executive session of the House committee.

This country has in France about 1,200 aeroplanes, but the majority of them are training planes and are of English and French manufacture. There are only a few dozen Liberty motors in France.

The aviation service has expended or contracted for the entire $740,000,000 appropriation given by Congress at the last session, and to-day presented a deficiency estimate to the House committee.

For this huge sum there have been produced in this country about 5,000 planes within the last year. Nearly all of this number are training planes, and a very few are equipped with Liberty motors. William C. Potter was quoted as saying to the House committee to-day that "the Liberty motor is still in the process of refinement and perfection."

Simultaneously Mr. Potter, a civilian but recently assigned to the equipment task, told the House committee that unquestionably a great deal of valuable time has been sacrificed in experimentation and necessarily large sums of money have likewise been sacrificed which might have been saved by the earlier manufacture of foreign motors.

Baker Asks Secrecy

At the morning session of the House committee Secretary Baker was present. The Secretary asked the utmost secrecy for the army's aviation program and the estimates for $1,032,000,000 submitted by the War Department.

About a dozen officers of the Signal Corps, including Major-General Squier and his immediate assistant, Brigadier-General Saltsman, were present at the hearing, but Mr. Potter and Brigadier-General William L. Kenley, chief of the aeronautical division, occupied most of the time. John D. Ryan, newly appointed head of the Aircraft Production Board, did not testify, although present.

Action on Pershing's Advice

In ordering the cancellation of large contracts for Liberty motors and the substitution of the Bugatti and Hispano-Suiza motors the War Department acted on direct advices from the western front, in which advices it is understood both the French, English and American commands concurred.

This cancellation, it was explained, does not mean that the Liberty motor is a failure, but its use is to be restricted to "heavier purposes," and it is not the ideal motor for combat and pursuit. The large 'plane which necessarily must accompany this motor, it was said, makes it unsuitable for speed purposes.

The Duesenberg Company and the Wright-Martin Company have been given contracts for the substitute production of the French motors.

A shortage of spruce and the shipment of four-fifths of the spruce supply of this country to the Allies within the past year were advanced as partial reasons for slow production.

General Accounting Made

Figures presented to the House Military Affairs Committee by W. C. Potter, Chief of the Equipment Division of the Aviation Section, United States Army, convinced members that much of the criticism leveled at the Administration would not have arisen had the War Department officials frankly explained from time to time the difficulties encountered in aircraft production.

So far as could be learned, the $740,000,000 apportioned for aviation has been expended as follows:

The War Department has expended $307,000,000 for aeroplanes and fields.

There is an unexpended balance now on hand of $433,000.000.

Of the unexpended balance, all is covered by contract, and additional contracts have been let for machines and other equipment which provide for expenditures of $148,000,000 beyond the appropriation.

The money already expended has been used as follows:

For engines and aeroplanes and general machine equipment	$163,000,000
For hangars and the acquirement of aviation fields in this country	42,000,000
For aviation fields and other purposes in France	31,000,000
For gas balloons	5,000,000

There is $31,000,000 in the hands of the Disbursing Agents and not reported at the hearing.

The balance has been spent for miscellaneous aviation work, for experiments and other general expenses connected with the program.

Liberty motors are now being made at the rate of 100 a week, Mr. Potter informed the committee.

The Government has ordered 14,000 foreign planes, and 1,800 have been delivered, he said, while 8,000 foreign engines have been contracted for, the deliveries amounting to fewer than 1,500.

There are between 1,200 and 1,400 aviators actually flying with the American forces on the western front.

There are 5,000 men physically fit and ready to enter the service, while there are 15,000 flying and non-flying aviation service officers in the United States and France.

In the Signal Corps to-day there are 133,000 men and officers, which exceeds the strength of the regular army when this country entered the war.

Senator Chamberlain's Speech

Senator Chamberlain surprised the Senate in the suddenness with which he proclaimed the intention of the Military Committee to plunge again into the maelstrom of an investigation. He said:

"I feel impelled to make a few observations in view of the letter from the President to the Senator from Colorado. I have never seen the Borglum report referred to therein. I have never had any conversation with Mr. Borglum, although I saw him a little while yesterday in the committee room in company with a few other members of the committee.

"I infer in a general way from the statements published with reference to the Borglum report that it had reference more particularly to dishonest transactions or transactions of a pro-German character affecting the general work of the Aircraft Board. Whether that is true or not I do not know.

"I should like to see that report and shall make an effort to read it as well as the other report bearing on the same situation. The Committee on Military Affairs some time ago made a general report dealing in a general way with aeroplane production without going into details as to the expenditure of particular sums of money by the Aircraft Board or by any of those associated with it in aeroplane construction.

Conclusions All Agree

"It is only necessary to say that the conclusions of the committee were the same as those which were reached by the Marshall committee, which investigated the subject at the request of the President. The same conclusions reached by the Marshall committee and the Committee on Military Affairs were reached also by Mr. Borglum; in other words, that there ought to be a change in the method of aircraft production, that there ought to be centralization of effort. The President has now undertaken to carry out these suggestions made in all of these reports by centralizing the work done under the direction of Mr. Ryan.

"I hope to see better results follow from this centralization of power, authority and effort, placing the whole aircraft program in the hands of a man who has been accustomed to do things well and who having been successful in his own affairs—is likely to be successful for the Government."

May 8

Open Hearings on Air Charges Urged

Chairman Chamberlain of the Senate Military Affairs Committee will delegate the task of investigating the aircraft situation to a sub-committee which will do the work without fear or favor.

It is hoped in army circles that the Senate committee will begin by examining Gutzon Borglum, author of the charges against the Aircraft Production Board, and that the hearings will be open to the public. The belief is that the War Department will not object to this procedure, especially as it will be possible to have secret sessions when necessary in the interest of military secrecy.

At present a majority of the committee is believed to favor secret sessions. Senators who favor secrecy say that some of the officers of the United States Army who have expressed a willingness to lay bare what they know of the unfortunate conditions in the aircraft program are not anxious to appear in public.

They feel that publicity would result in reprisals from higher up and might cause efforts to drive them out of the army. The men who are known to be willing to tell the Senate sub-committee what they know are not confined to officers of the reserve force or uniformed experts who have been nominally army men since the United States entered the war, but in many instances they are West Pointers of long service and recognized loyalty.

Suggested for the sub-committee in addition to Senator Reed are Senators Thomas (Col.), Kirby (Ark.), or McKellar (Tenn.), Democrats, and Senators New (Ind.), and Johnson (Cal.), Republicans. Only two of the Democrats will be selected, and it may be that in the end Senator Thomas will feel that he is unable to serve.

May 9

Baker Refuses Court of Inquiry to Officers at This Time

Senator Thomas of Colorado, a member of the Military Affairs Committee, declared in the Senate that, under the Administration's contracts with aeroplane manufacturers it appeared as if there had been "huge profiteering." He urged that the contracts be revoked. The existing system, he said, by which aeroplane producers were able to operate under one another's patents, as selected by the Advisory Committee on Aeronautics, was, in his opinion, "entirely wrong."

This interchangeable, or "cross-line," system of contracts, as it is called, under which aeroplanes have been made for the American Army since the country's entrance into the war, has operated, Senator Thomas said, to the advantage of the big manufacturers, who had been able to establish a monopoly, as they held the principal patents approved by the Advisory Committee.

Secretary Baker announced that he had been appealed to by Major General George O. Squier, Chief of the Signal Corps; Colonel E. A. Deeds, Chief of its Aircraft Equipment Division, and Colonel R. L. Montgomery, Chief of its Aircraft Contract Division, for courts of inquiry in connection with the aircraft situation. The Secretary said he would not at this time grant their applications, because he did not care to parallel the Senate and Department of Justice investigations.

"The War Department," he said, "is anxious to facilitate and expedite in every possible way the inquiries already instituted by the Department of Justice and the Senate committee. A third examination of the same set of facts at the same time might delay the inquiry, and for that reason I shall hold these applications unacted upon for the immediate present."

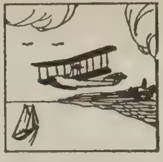
May 10

What amounted to charges that Gutzon Borglum, the sculptor, sought to use for personal gain the commission given him in January by Resident Wilson to inquire into the aircraft program, were laid before the Senate by Senator Thomas of Colorado. Documents were presented and read into the record which were intended to show that Mr. Borglum, while engaged on the inquiry intrusted to him, was dealing with a manufacturing concern with the purpose of forming an aircraft production company that would receive assistance in getting contracts through Mr. Borglum's reputed standing with the White House. The documents, which included sworn statements, letters and telegrams, come from the files of the Army Intelligence Office.

The story in brief, from the view suggested by the documents presented to the Senate, is that Mr. Borglum became acquainted on a railroad train with Kenyon W. Mix, Jr., whose father is said to be the controlling factor in the Dodge Manufacturing Company of Miskawaka, Ind., and subsequent meetings between them resulted in discus-

(*Continued on page* 510)

THE NEWS OF THE WEEK



Air Service Institute Organized

The Aero Club of America has been advised of the organization of the Air Service Institute of the United States, which is to be conducted on the lines of the U. S. Naval Institute, which was organized in 1873 and is the leading naval organization in the United States.

The objects of the Air Service Institute of the United States will be the advancement of professional and scientific knowledge in military and naval aeronautics.

Major William Thaw, the dean of American aviators in France, has been selected as president; Major Raoul Lufbery, the other American Ace, as first vice-president.

All the other officers selected as officers of the Institute are well known Army and Navy aviators, as follows:

Col. Charles de F. Chandler, the veteran expert in ballooning; Lieut. Com. U. D. Herbster, U. S. N., who was the third naval aviator to be trained; Major A. R. Christie, U. S. A., one of the veteran Army aviators who served at the Mexican border; Lieut. Col. C. C. Culver, recognized as the leading aero radio expert in the United States; Lieut. Com. Warren G. Child and Lieut. Com. L. H. Maxfield, two other veterans of the Naval Air Service; Major Jack W. Heard, another veteran Army aviator; Capt. F. L. La Guardia, the New York Congressman, who joined the Air Service at the start of the war; Major Cushman A. Rice, of the Army Air Service, veteran of the Spanish-American War; Capt. Thomas A. Baldwin, the veteran balloon expert; Capt. K. G. Pulliam, Jr., U. S. A., and Lieut. C. E. Ruttan, U. S. N. R. F. C.

Twelve more officers are to be selected from the Army and Navy Air Service to make up the Board of Directors

The by-laws of the Institute provide that the officers in charge of the Army and Navy Air Service in the United States and in France shall be elected honorary members.

Following the practice of the U. S. Naval Institute, the Air Service Institute will offer prizes annually for the best essays, which will be on aeronautic subjects, and the annual membership dues will be two dollars.

The essays will be published in the Institute's official organ, which is to be called "Air Power."

The Air Service Institute has temporary offices in the Union Trust Building, Washington, D. C. It will also have offices in France, England and Italy.

The membership of the Institute will consist of regular, life and honorary and associate members. Regular members shall be officers of the Army and Navy Air Service and all civil officers attached to the Air Service. Those who do not come under this class will be associate members.

The officials of the Aero Club of America have extended their hearty co-operation to the Air Service Institute.

Navy Must Quadruple Plane Output

Washington, D. C.—It has been found necessary to quadruple the output of the navy's aeroplane factory at League Island, Philadelphia. This will be accomplished by making the plant an assembling factory for naval aircraft and placing contracts for parts with scores of manufacturers.

The Philadelphia factory reached its maximum of production within eight months from its inauguration, but the order for quadrupling its output requires the placing of large additional contracts with aeroplane parts manufacturers.

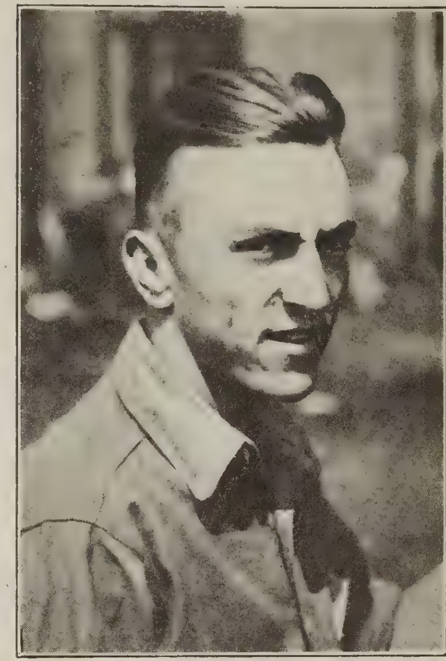
Auto Manufacturers Need War Contracts to Counteract Curtailment Order

Washington—Representatives of the National Automobile Chamber of Commerce, who were in a three-day conference with the War Trade Board, having agreed to a heavy curtailment of pleasure car production, pointed out the necessity of their receiving war contracts for aeroplane engines, ambulance trucks, tanks, tractors, gun carriages, mine anchors, shells and other munitions, in order to keep their organizations intact.

On the committee of manufacturers are W. C. Durant, J. N. Willys, John F. Dodge, W. E. Flanders, C. C. Hanch and Hugh Chalmers. They issued the following statement:

"After a thorough investigation the committee was convinced that the demands of the government, direct and indirect, were very great, and, conceding that these demands should be given unquestioned priority, volunteered all possible assistance and pledged the entire resources of the automobile industry to speeding up the war programme, at the same time keeping in mind its accomplishments, with so little disturbance to general business as possible.

"Until the government requirements are more definitely known, the automobile industry, in addition to the manufacture of aeroplane engines, ambulance trucks, tanks, tractors, gun carriages, mine anchors, shells and other munitions, will apply itself to helping to solve the great problem of transportation, which is directly in its line."



"Eddie" Rickenbacher, the famous automobile record holder, has downed his first German plane

War Inventions Section New Division of General Staff

Washington, May 11.—In order to promptly consider all inventions of mechanical, electrical or chemical nature, the Secretary of War announced that a new division of the General Staff has been created. The announcement states:

"Inventions may be sent by mail or may be submitted in person, accompanied by written descriptions or drawings. They go first to an examining board having technical knowledge of the classes of inventions they handle, whose investigations determine whether the inventions have merit. Those which possess merit are referred to the Advisory Board.

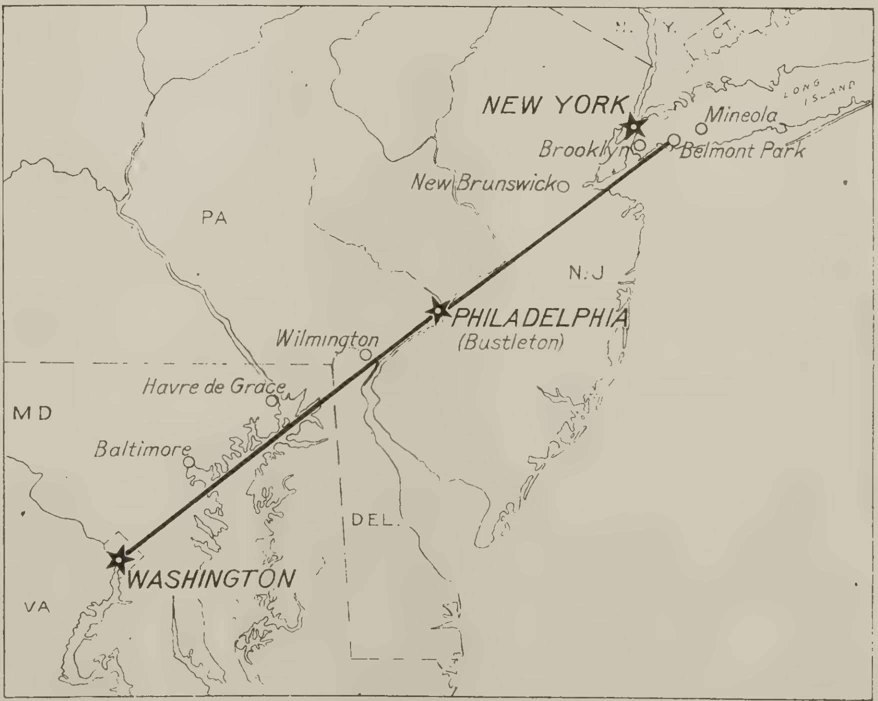
Composing the Advisory Board of present are the following:—

"D. W. Brunton, member of Naval Consulting Board, and chairman War Committee of Technical Societies; Dr. Graham Edgar, member National Research Council; Colonel James W. Furlow, Quartermaster Department, Chief of Motors Division; Colonel J. A. Hornsby, M. C., Chief of Hospital Division, Surgeon General's office; Lieutenant Colonel Morgan L. Brett, Ordnance Department, Engineering branch; Lieutenant Colonel A. Millikan, S. C., Chief, Science and Research Division; Lieutenant Colonel N. H. Slaughter, S. C., Chief of Radio Development section; Major Joseph A. Mauborgne, S. C., Chief, Electrical Engineering section.

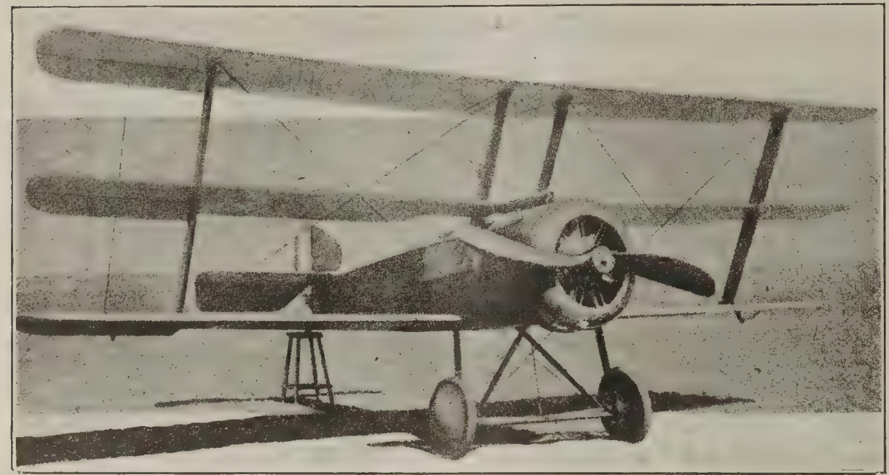
"When completed the Board will have twelve to fifteen members, to cover fully all of the various technical problems which may come before it.

"In testing and developing inventions and in considering problems presented by staff departments, the Advisory Board works in connection with a number of agencies. Among them are the following:—

"Research Council, Bureau of Standards, War Committee of National Technical Societies (this committee consists of two members detailed from each of the ten important technical societies in the United States), laboratories and shops of the staff and supply departments of the army, Patent Office, Aircraft Production Board, all army service schools, C. L. Norton, Massachusetts Institute of Technology, Cambridge, Mass.; Dr. Charles P. Steinmetz, General Eletric Company, Schenectady, N. Y.; A. H. Beyer, chairman Committee on Testing Laboratory, Columbia University, Broadway and 117th street, New York City; R. R. Abbott, metallurgist, Peerless Motor Car Company, Cleveland, Ohio; Dr. John A. Mathews, president Halcomb Steel Company, Syracuse, N. Y.; Knox Taylor, president Taylor-Wharton Iron and Steel Company, High Bridge, N. J.; Howard D. Colman, Baber-Colman Company, Rockford, Ill.; Preston S. Miller, Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York City; Herbert Fisher Moore, University of Illinois, Urbana, Ill.; L. F. Miller, metallurgist, Mitchell Moore Company, No. 1,832 Asylum Avenue, Racine, Wis.; E. J. Okey, the Timken Roller Bearing Company, Canton, Ohio, and Dr. Alee Hrdlicka, cura or, division of physical anthropology, United States National Museum, Washington, D. C."



AERIAL MAIL ROUTES. WASHINGTON-PHILADELPHIA-NEW YORK.



A Sopwith Triplane, photograph of which appeared in a German periodical

Miss Katherine Stinson Postal Air Clerk

Miss Katherine Stinson, the aviatrix, has been sworn in as a postal clerk, and has been assigned the duty of carrying mail from Chicago to New York by aerial mail. She expects to accomplish the flight in eleven hours.

Evan J. David Addresses Harvard Aeronautical Society

Mr. Evan J. David, the business manager of "Flying," addressed the Harvard Aeronautical Society on May 9th on "Aircraft in Warfare." The lecture was well attended, not only by members of the society, but by the Harvard faculty and the student body in general.

With Our Boys "Over There"

Flight Captain James Norman Hall, author and one of the best-known American aviators, is missing after a thrilling battle between three American aeroplanes and four German machines, ten miles inside the German lines. Captain Hall's home is Colfax, Ia.

An Associated Press Dispatch from France dated May 8th declares that the Germans have sent some of their best flyers to the Toul sector, where American aerial forces are operating, with a view of annihilating our airmen. Lieuts. A. J. Coyle, pilot, and Steward B. Board, observer of a photography aeroplane have been decorated with War Crosses for driving off three German Albatross machines, when attacked northwest of Toul, and then continuing on their mission.

Sergeant Frank L. Baylies, of New Bedford, Mass., and in the French Air Service, has brought down his seventh opponent. All his victories have been achieved in the last two months.

An American gunner recently accomplished the feat of bringing down a boche airman with a pot shot from a seventy-five mm. gun. The German had just crossed the lines over Toul. It is rare that artillery brings down an aeroplane over the front lines.

Lieut. A. L. Koyle, pilot, and Lieut. S. B. Bird, observer, were decorated with the Cross of War, according to a news dispatch from the "American Army in Lorraine." They fought three German aeroplanes directly over the front lines in an observation balloon.

Lieut. Gustav H. Kissel has been reported missing by General Pershing. He is the son of Rudolph H. Kissel, a prominent New York banker. Lieutenant Kissel enlisted in the Aviation Section a week after we entered the war and acquired the reputation of being a very skilful airman. He was a member of the Harvard Class of 1917.

A group of American aviators on duty "somewhere in France." On the extreme left front row is John Guy Gilpatric, well known to Aerial Age readers, as a contributor to its columns

Major William Thaw and Paul Frank Baer have again been cited in the "Journal Officiel."

Automobile Club of France Offers Prizes for Kerosene Carburetor

Paris, France—Three prizes of $10,000, $2,000 and $400 are offered by the Aero Club of France for the most satisfactory automobile engines running on kerosene of 810-820 density and with minimum flash point of 35 deg. Cent. in Garnier apparatus. Exacting laboratory and road tests will be applied to ascertain the respective merits of the various contestants.

At the Aviation Fields

Captain Alfred Heurtaux visited Ellington Field, Olcott, Texas, on April 18th, making a detailed inspection of the fields, shops, schools and hangars.

The Willys-Overland building ih Minneapolis, Minn., has been turned into a branch aviation training school for Dunwoody Institute. Aviation mechanics will be taught in the new building under Commander William J. Terhune, formerly in charge of the Key West naval training station. The men will be quartered in the Willys-Oveland warehouse.

The first class of the year passed the Reserve Military Aviator tests at Chaunute Field and have been commissioned second lieutenants. In former times the officers were recommended for commissions here after passing their tests and several weeks later they would be notified from Washington, D. C., that they had been accepted. Under the new method commissions are given at once.

Two aviators, Lieut. Arthur Laverents and C. C. Cotton, from the Naval Reserve aviation training school at Miami, Florida, had a thrilling experience when on a trial spin on May 5th. The two aviators started on a coast patrol flight in a large seaplane. Far out, they were forced to make a landing on account of engine trouble, and the heavy sea began pounding the sturdy seaplane. It was not long before several sharks appeared. The aviators tried to repair their machine, but were unable to do so. To add to their difficulties, one of the pontoons smashed. After drifting all day and all night Sunday, they were rescued by the steamer Sixaola.

Before a crowd of 25,000 people, some of America's foremost champions of track and field, who are now learning the art of flying, performed in spectacular fashion at the field day and athletic meet held at Camp Dick on May 11th.

Fred J. Kelly, former Olympic champion, won the 120 and 220 yard hurdles. Other contestants in the meet were: Harry Babcock, famous Columbia pole vaulter; Nichols, former track captain at the University of California; Charley Harley, of Ohio State; M. J. Hayes, the Princeton sprinter; Charles Stout, Western Intercollegiate Conference Association champion; E. L. Sanders, Illinois University runner; Templeton, Leland Stanford, high jumper; etc., etc.

Under the command of Captain C. F. Betz, the first group of eight hundred men are soon to finish their term of instruction at the Army School for Aerial Photography, at Rochester, New York. Plans are being formulated to give the men practical experience in flight.

New Export Regulations

Washington, D. C., May 12.—In order to further conserve shipping space and tonnage, the War Industries Board, in cooperation with the Food Administration and War Trade Board will require the issuance of shipment licenses on all exports on and after May 15th, including such shipments as already have been licensed for export.

Applications for shipments for the United Kingdom must be made to the British War Mission, Munsey Building, Washington, D. C.; for France, to the French High Commission, 1954 Columbia Road, Washington, N. W.; for Belgium, to the Belgian Commission, Room 202, Council of Defense Building, Washington, D. C. Upon the approval of these applications, they will be forwarded by the commissions to the Bureau of Exports, Washington, D. C.

Applicants must agree not to acquire of manufacture for export articles specified in the application, until licenses are granted for shipment. Food manufacturers and exporters and all "essential" industries fall within the new regulation.

On July, 1918, all licenses granted previous to May 15th, expire.

Colonel Disque to Confer with Chief of Staff

Washington, D. C.—Colonel Brice P. Disque, who has charge of the Spruce Production Division, with offices in the Yeon Building, Seattle, Washington, has been ordered to report to the Chief of Staff, Washington, D. C., for conferences at the War Department. Through Colonel Disque's efficiency and energy, there has been a great increase in the production of spruce, which is used more than any other kind of lumber in aircraft construction, and a large proportion of which is produced in Washington and Oregon.

President Asks Boy Scouts to Take Walnut Census

Washington, D. C.—At the request of President Wilson, the Boy Scouts of America have been asked to take a census of walnut trees in the United States. The President's letter says in part: "In order to carry out the programme of the War Department it is of the utmost importance that large quantities of black walnut lumber should be secured for its use. Black walnut is used by the Ordnance Department for the manufacture of gun stocks, and by the Signal Corps for the manufacture of propellers for battle and bombing aeroplanes."

Augustus Post Lecturing Extensively

Mr. Augustus Post, honorary secretary of the Aerial League of America, is continuing his educational lecture work on aeronautics. Recently he has spoken before the Contemporary Club of Philadelphia, the Barbadoes Club, Emerson High School and various other organizations. Mr. Post has also spoken on the Sub-Treasury steps, Hotel Plaza, and numerous other places in behalf of the Liberty Loan.

German Aircraft Weakened By Improper Materials

Shortage of spruce is compelling Germany to substitute steel and aluminum, with the result that many aviators are being lost through accidents. It is said that steel cannot withstand the sudden strains of rapid manœuvres, and one correspondent states that Allied aviators do not always employ their machine guns in vanquishing their adversaries, merely manœuvring in such a manner as to compel the Germans to make a quick "corkscrew" turn. Unable to endure the sudden wrench, the steel braces supporting the aluminum wings sometimes snap, and the aviator is downed.

British Air Forces Memorandum Explains Terms of Service

Every person enlisted in the Royal Air Force is liable for duty afloat or ashore, at any station at home or abroad, and may be detailed to any branch of the service; and may be called upon, if medically fit, to go into the air in airships, aeroplanes, seaplanes, kite balloons or any type of aircraft. The selection of a man for service does not imply that he will be trained as a pilot. The chief requirements for candidates to the Cadet Wing are: Age, over 17 years 11 months, and under 30 years. Height, less than 6 feet 1 inch. Weight, less than 182 pounds.

The pay is as follows: Upon enlistment and during preliminary training, $.36. At school of aeronautics, $1.96 per day plus $.96 per day on each day requiring flights. Graduated flying cadets, $2.40 per day plus $.96 per day on each day requiring flights.

Fonck Advises American Fliers

In an interview with a New York "Times" reporter recently, Lieutenant Fonck, the famous French ace who has downed thirty-three German aeroplanes, stated that for Fonck four things count as an air fighter's assets: Flying ability, accuracy of shooting, automatic swiftness of decision and coolness. Unlike many great fliers—Lufbery and Guynemer, for example—he does not put shooting first.

"Manoeuvring your opponent is the chief thing," he said. "Directly I engage an enemy I can judge what line to take. You can tell from the outset just what quality of pilot is opposed to you, and must act accordingly. I have never fought Richthofen, but I am certain I should know in ten seconds that I was at grips with him if we met, and he would know, too. The way a pilot handles his machine is an unfailing indication of his calibre.

"Don't believe the stories about the most successful airmen diving from a great height and abandoning the struggle if the enemy is missed. That may have been true once, but at present such tactics are impossible You must fight and fight close. The victorious aviator is the man who knows best how to handle his machine so as to meet changing situations most adequately, and who has the quickness of decision to translate that ability at once into action."

"But against heavy odds," the reporter said. "Surely you are at a disadvantage when several attack you at once."

Lieut. Richard F. Harris, one of the editors of "Tale Spins," published by the cadets and officers at Ellington Field, Houston, Texas

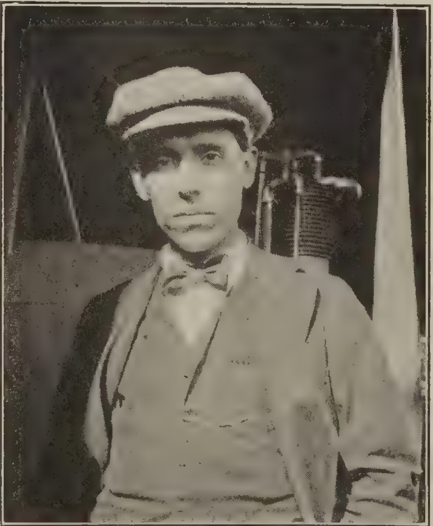
"Not in the least," he replied. "You just give ground and manoeuvre them"—he emphasized the word—"and then go for the one who is in the worst position."

"The greatest number I ever fought alone was seven, at Verdun, I dodged around until I got my opportunity, and then went for one and downed him. A moment or two later I got another and gave a third more than he liked, so that he made off. That left four. I dived at one, and, although I missed him, came so close"—Fonck begins firing at 150 yards and continues until he is five yards distant, when he swerves for an instant to avoid collision—"that he decided to quit also. When I wheeled to tackle the rest they were streaks on the horizon."

Asked if he had any advice to give to the American airmen, Lieut. Fronck replied:

"Avoid all excess and train as for a prizefight. From the practical point of view the best thing is to get attached to a first-class French group. We know the game, and a young pilot cannot do better than fly with a group in which there is at least one crack. The latter not only gives the confidence which is essential to novices, but shows them how, and is there to disengage them from awkward positions.

"Secondly, tell them to learn their machine and engine thoroughly. Ninety per cent of aviators are forced to trust their lives to mechanics for tuning up. That is not good enough for me. Without boasting, I may say I can take any machine of our group, and in a week it will be the best of the lot—not because I am specially clever, but because I know the whole outfit thoroughly. And it is worth learning, because my life depends on it."



E. V. Bellanca, the inventor and designer of the Bellanca Aeroplane, and the Bellanca patented turnbuckle

The Effects of High Flying

I have found the effect of high, *i. e.*, rarefied, air to be felt slightly at about 10,000 feet, increasing with the altitude. Breathing becomes affected, respiration shorter and quicker, there is a curious oppressive sensation and a bulging feeling in the head until the height of about 20,000 feet is reached. I am told by a medical friend who has made rather a study of the subject that there is always a risk of a sudden collapse, and oxygen should be used whether the aviator feels fit or not. Of course, the effect felt varies considerably with individuals, and with the state of one's health. About 18 months ago I suffered slightly with my heart, and found I could not get very high without feeling giddy, and after returning from a flight to 12,000 feet I had palpitation, which lasted until the following day. In consequence I had to abandon high flying until treatment got me fit again. This year I have made a number of high flights and have felt no ill effects whatsoever; in fact, I find the more one gets accustomed to going up high the less the effects are felt. I am told that this also is the case in mountaineering. I can remember the unpleasantness of my first flight to 15,000 feet. It was very marked, especially the pain experienced in the drum of the ears on descending.

The fact that a flight now to 21,000 or 22,000 feet does not have so much effect I put down entirely to acclimatization. I use oxygen as a precaution when ascending beyond 20,000 feet, for the previously mentioned reason. A small bottle is carried, fitted with a special reducing valve, which is fixed in the fuselage within easy reach of the hand. No special regulation is required, as it is set to pass only the necessary amount of gas into the face mask which acts as a mixing chamber, with its inlet and outer air valve. The apparatus weighs 16 pounds, and contains sufficient oxygen for one hour's continuous use. After reaching 20,000 feet I find it is only necessary to use the oxygen intermittently, and accordingly I simply hold the mask, after turning on the gas, over the mouth and nose and take a few breaths of it, perhaps every half minute. The effect to me is remarkable; most of the oppressing feeling vanishes, and, excepting for the unpleasant bulging feeling of the head, which you experience with a bad cold, the sensation is one of suddenly being again at ground level.

The only after-effects upon landing from these high altitudes are that you seem to acquire a pretty good thirst, due, I suppose, to the use of oxygen. If the speed of climb continues to improve at the rate it has for the past three years, it looks as though aviators will become subject to what is known as "Caison Disease," due, I am told, to the sudden reduction in atmospheric pressure, such as divers are subjected to when they come to the surface from a great depth, owing to the nitrogen, which has been absorbed by the system, in proportion to the atmospheric density, forcing itself too rapidly at any lower pressure from the system.—Abstract from a paper before the Aeronautical Society of Great Britain by Capt. B. C. Hucks.

New Aircraft Company in New York City

Aeroplanes are to be made at City Island, New York City, in the Robert Jacob shipyards, where some of the American cup defenders were turned out. Plans were filed recently with the Building Department for the new factory, which is to cost $210,000, from plans by the Louis P. Fluhrer Company. It will be one story, 60x200, of reinforced concrete.

With "Our Boys" Abroad

Sergeant Vernon Booth, Jr., of New York, a member of the American Flying Corps in France, married Miss Ethel Forgan, daughter of David R. Forgan, a Chicago financier, in Paris on April 27th. Sergeant Booth recently brought down his second German aeroplane and as a reward, a ten day's leave was given him to enable him to get married.

Lieutenant Ely, a member of the Lafayette Escadrille, a native of Chicago, Illinois, died from injuries received in an aeroplane accident in France.

The French Government has awarded the War Cross to Sergeant David E. Putnam of Brookline, Mass., a member of French Escadrille, No. 156; William A. Wellman of Cambridge, Mass., of Escadrille No. 87, and Phelps Collins of Detroit, a member of the Lafayette Escadrille.

Collins was killed on March 13th in an aerial combat. Putnam, Wellman, and Collins enlisted in the Foreign Legion early in the war and fought in the trenches for a long time before joining the aviation service.

The AIRCRAFT TRADE REVIEW
N. E. J.

Government War Finance Corporation Organized

President Wilson has named the four directors of the War Finance Corporation, who will control the $500,000,000 which has been appropriated for the purpose of aiding in the financing of essential war industries. They are: W. P. G. Harding, Governor of the Federal Reserve Board; Allen B. Forbes, New York; Eugene Meyer, New York, and Angus W. McLean, Wilmington, Delaware.

The corporation will start with a capital stock of $500,000,000 and has authority to issue $3,000,000,000 in bonds with which to finance its operations. Loans may be made to banks amounting to 75 per cent of the face value of loans made by banks to any business "whose operation shall be necessary or contributory to the prosecution of the war."

Direct loans to essential industries may be made to essential business, if the directors of the War Finance Corporation decide that such an advance is necessary. In such cases 125 per cent collateral is required, but the loan is limited to **12½ per cent of the corporation's** total capital stock and outstanding bonds. The War Finance Corporation has quarters in the Treasury Building, Washington, D. C.

An important part of the corporation is its Capital Issues Committee, consisting of seven men, which have authority to pass on new issues of stock amounting to $100,000 or more. While the committee has not the power to directly prevent the issuance of more than that amount of stock by any corporation, it can, with the co-operation of the Federal Reserve Board, make it impossible to sell an issue of stock amounting to $100,000 or more, without its approval.

Universal Machinery Company Building New Plant

Milwaukee, Wis.—The Universal Machinery Co., manufacturer of lathes, boring mills, drill presses, etc., is planning to build a complete new plant in West Allis, the manufacturing suburb of Milwaukee. The first units to be built will be a machine shop, foundry, power house and auxiliary structures. J. E. Purdy is secretary and treasurer of the company.

Stewart-Warner Employees Buy Liberty Bonds

Chicago — The Stewart-Warner Speedometer Corporation has subscribed for $201,400 worth of Liberty Bonds. Within four days after the opening of the campaign, 1,637 employees had signed subscriptions. These figures are for the Chicago factory only, and does not include the subscriptions of the Beloit plant, or of the 60 branch offices and service stations.

Splitdorf Magneto Gets Another Government Contract

Washington, D. C.—The Splitdorf Electrical Co., of Newark, N. J., has been awarded a contract by the War Department for magneto parts. They are the manufacturers of the famous "Dixie" magnetos.

France Protects Gasoline Supply

Paris, France.—All gasoline used by the French army is now being tinted red, in order to prevent its getting into civilian hands by illegal means. A product has been found which will give it this distinctive color without injuring its qualities. It has been found where this check on the supply has been applied, that there has been a reduction in the average consumption of gasoline, indicating that no inconsiderable quantity had previously found its way into improper hands.

For a considerable time, gasoline has only been supplied to those who have absolute need for a car and who were expected to use it for a specified purpose.

Pleasure Car Output to be Curtailed 75 Per Cent

Washington, D. C.—The War Industries Board has decided on a 75 per cent curtailment of the production of passenger automobiles. Piano manufacturers have already been ordered to reduce their output by 30 per cent. The release of the facilities of both of these industries offers an opportunity for increased aeroplane production.

Figures On New Curtiss Factory

Photographs appearing in British aircraft papers of the new Curtiss aeroplane factory in Buffalo, which is nearing completion, give an indication of the enormous size of the plant. The building is stated to be half again as long as the Hamburg-American liner Vaterland. In its construction 5,800 tons of steel and 7,000,000 board feet of lumber were required. Nearly 3,000 men were at work at one time in the erection of the building and the whole contract price was in the neighborhood of $5,000,000.

Lawson Aircraft Tested

The latest aeroplane to be turned out from the Lawson aircraft factory at Green Bay, Wisconsin, was recently tested by Mr. Lawson and George Pufflea. Six flights were made, and the machine remained in the air for two hours.

Walnut Lumber Needed for Propellers

Washington, D. C.—In a circular letter to manufacturers of veneer, Major E. A. Shepherd, of the Ordnance Department, has requested that they refrain from manufacturing veneer from walnut lumber other than butts, crotches or figured material, none of which is suitable for stocks or propellers. This material is urgently needed by the Government.

Personal Paragraphs

Donald Anthony has resigned as manager of the Baltimore branch of the Locomobile Co., to join the Aviation Section of the Signal Corps.

J. V. Thomas has been promoted to the position of sales manager of the B. F. Stearns Co., of Cleveland. The Stearns Co. is making Rolls-Royce motor parts.

Gasoline Production Increased One-Third In 1917

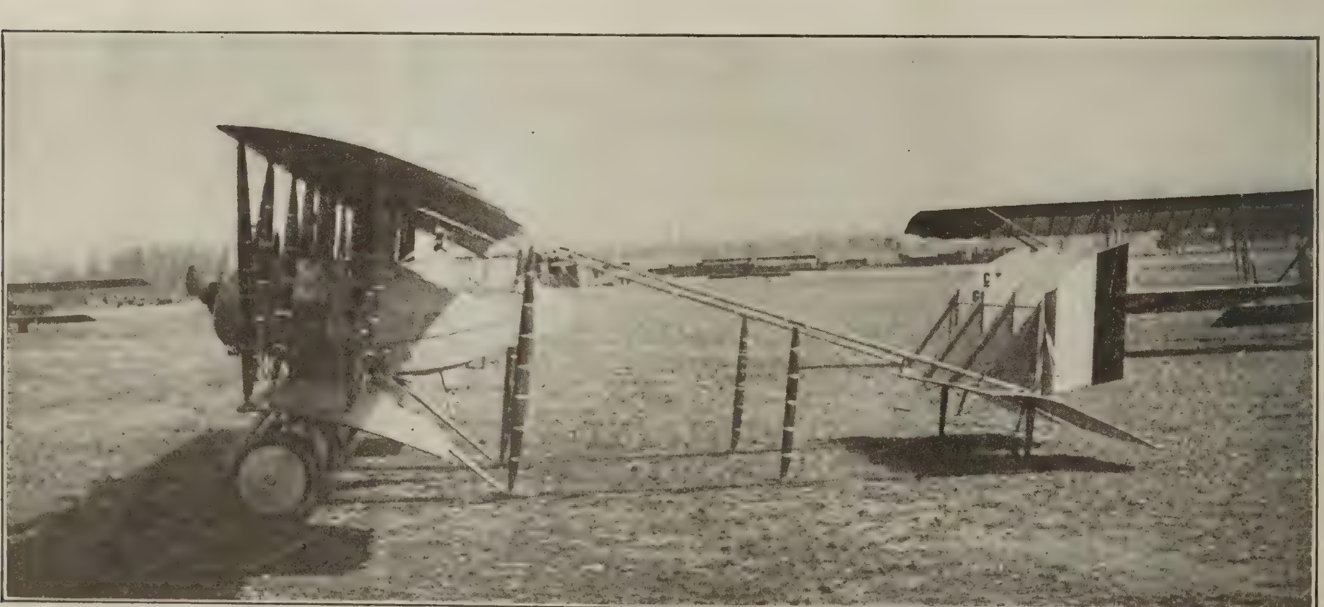
Washington, D. C.—During 1917 the production of gasoline increased 32 per cent, or nearly 2,000,000 per day more than in 1917. The total production for the entire year was 2,729,712,033 gallons, or an increase of 670,831,437 gallons. The production of kerosene increased 7½ per cent and that of crude oil 22 per cent.

Willys-Overland Increasing Output

Toledo, O.—The Willys-Overland Company will increase its working force from 12,000 to 15,000 men. During March, says *Automotive Industries,* the company produced and shipped 832 Curtiss training aeroplane engines.

Bosch Company Reorganized

The personnel of the Bosch Magneto Co. has been completely reorganized and, under Government supervision, plans a considerable expansion of its magneto business. The new officers are: President, Joseph H. Bower, of New York; Vice-president, Christian Girl, of Cleveland; treasurer, George McDonald, of New York;



The Caudron type G used extensively for elementary training in the French Air Service. Note the landing skid extending from the wheel to the tail skid (French Official Photo)

Scene at one of the French flying fields, with some of the elementary Caudron training machines in evidence (French Official Photo)

secretary, William G. Fitzpatrick, of Detroit; assistant treasurer, A. D. Altree, of New York; general manager, A. T. Murray, of Allentown, Pa.

By the induction of these officers, greatly increased output may be expected. At present 800 men are working at the Springfield plant, and only a small proportion of its output is being utilized for Government purposes.

Tire Manufacturers Raise Prices

Washington, D. C.—Owing to the rising cost of cotton fabrics and labor and the expected shortage of crude rubber, due to the new regulation of the Shipping Board, which cuts down the imports of crude rubber by 50 per cent, there has been a general advance in the cost of tire prices on the part of all the large manufacturers of tires, amounting to at least 10 per cent.

Great Lakes Rubber Co. Organized

Milwaukee, Wis.—A rubber manufacturing company has been organized by Donald C. Barbee, general manager of the Badger Belt & Rubber Co. with a capital stock of $100,000. Five acres of land have been purchased in Cudahy, a suburb of Milwaukee, and the first unit of the plant will provide 45,000 feet of floor space. The new company is to be known as the Great Lakes Rubber Co.

Dividends Declared

The Standard Parts Co. has declared a regular quarterly dividend of 1½ per cent on the common stock, payable May 15 to stock of record April 30.

The Westinghouse Electric & Mfg. Co. has declared a dividend of 1¾ per cent (87½ cents per share) on the common stock for the quarter ending March 31. This will be paid on April 30 to holders of record April 4.

The Stewart-Warner Speedometer Corp, has declared a quarterly dividend of 1½ per cent payable May 15 to holders of record April 4.

The Fisher Body Works has declared a regular quarterly dividend of 1¾ per cent, payable May 1 to stock of record April 20. The Fisher Body Works has contracts with the Signal Corps for aeroplane parts.

Detroit Labor Situation Acute

Detroit, Mich.—The labor situation in Detroit is becoming serious. The present shortage consists of 20,000 men, and it is expected to grow to 35,000 within a short time. The great demand has caused manufacturers to advertise in the daily papers. Instead of improving matters, this increased the ranks of "floaters" who are attracted by the higher wages promised in the advertising.

As a result of the plea of a representative of the Detroit Board of Commerce in Washington, Government relief is expected, in the establishment of a Federal Employment bureau in Detroit.

Owing to the transportation situation during the winter, the Ordnance Department has concentrated its contracts with firms along the eastern coast. These, however, are now working near capacity, and hence Detroit, with its great facilities, is expected to receive a larger share of Ordnance Department work. This makes the labor situation more important.

Alexandria Aircraft Corporation

The Briggs Aeroplane Company, on and after May 15th, will be known as the Alexandria Aircraft Corporation. Mr. A. W. Briggs, general manager, has resigned and will use his name in another enterprise.

The Aircraft Industry and the Liberty Loan

The employees of the Brooklyn plant of the Doehler Die-Casting Co. subscribed $56,000 to the Third Liberty Loan.

AERIAL AGE merited a loan flag with nine stars—90 per cent of its personnel having subscribed to the Third Liberty Loan.

The 1,482 men and women workers of the Sprague Electric Works of General Electric Co. had a 100 per cent record, and their subscriptions totalled $116,850.

Navigation Instruments for Aeroplanes Costly

The Signal Corps has issued a detailed statement, pointing out the expense and problems which have been met, in the production of indicating and navigation instruments for aeroplanes. In addition to navigation instruments, actual combat planes, such as observing, photographing, bombing and fighting planes, require many other complicated and expensive instruments.

Among them are machine guns, gun mounts, synchronizers, bomb racks, bomb-dropping devices, bomb sights, radio, photographic, and oxygen apparatus, electrically heated clothing, lights, and flares. The cost of such additional accessories would bring the total cost of equipment for a plane to several thousand dollars each, depending upon the type of plane.

All these instruments must be ready for installation on the aeroplanes as soon as they are assembled, for no plane is complete without them. In some instances, particularly for the two seaters and the heavy bombing machines, 2 and even 3 instruments of each sort are necessary, totalling sometimes as many as 23, but for ordinary work only about 9 of them are needed. The average cost of a set of navigation instruments for a single plane is $350.

The Signal Corps is purchasing practically all the purely navigating instruments and selling them at cost to the manufacturers of the aeroplanes as they are needed to meet the actual output of planes. This provides one purchasing center and prevents the various airplane companies and the Government from competing against one another, creating disorder and confusion among the instrument manufacturers. At the same time it enables the Signal Corps to keep the supply of instruments adequate for the demands of the aeroplane builders, relieving them from this work, and it also affords standard equipment and interchangeability.

The various instruments developed by the Signal Corps include:

The tachometer, or revolution counter, which indicates the speed at which the motor is running. This instrument is being manufactured by three large firms, and quantity production has been reached.

The air speed indicator, which shows the speed of the aeroplane in relation to the air, has been standardized, but the statement gives no production figures.

Three types of altimeters have been developed, recording altitudes of up to 20,000, 25,000 and 30,000 feet respectively. Quantity production has been reached.

A successful aeroplane compass has been perfected after much experiment. One company is producing 200 a week.

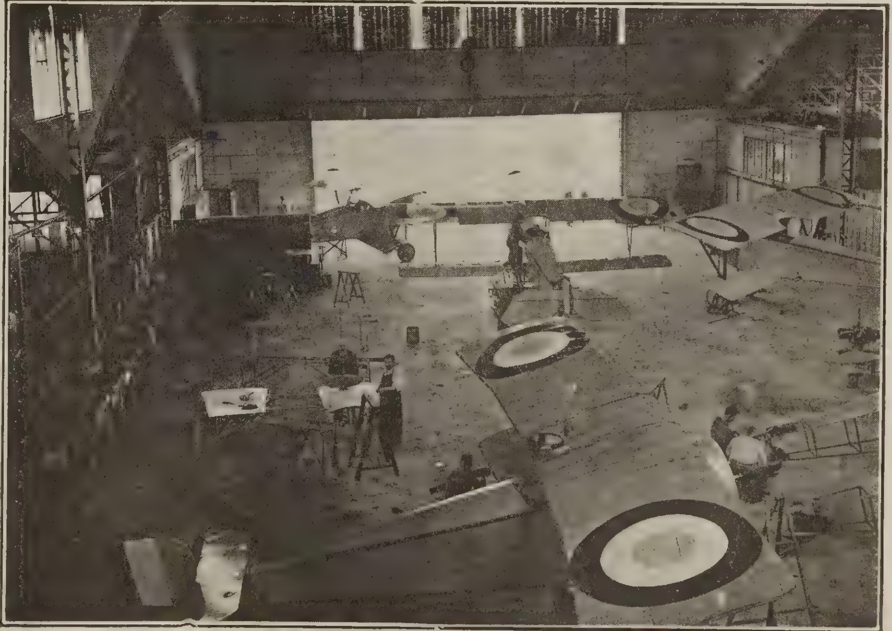
A standardized aeroplane clock was easily adapted from previously existing automobile clocks.

Standard specifications have been issued for pressure gauges for showing the gasoline pressure and oil pressure. They are being produced in quantities.

Two companies are manufacturing radiator thermometers, which form a fairly reliable criterion as to the condition of the motor and its cooling system.

Development work is still under way with a view to designing a reliable banking indicator, upon which much of the accuracy of bomb dropping depends.

An improvement has been made on the Aldis sight, which is used for sighting machine guns firing through the propeller, which makes the Signal Corps model superior to the popular English model.



Final assembly in a French aircraft factory of training and pursuit machines (French Official Photo)

WOODWORKING MACHINERY IN AEROPLANE CONSTRUCTION

THE building of aircraft is, of course, divided into two sections, the one being concerned with the production of the engine, and the other with the machine itself.

The woodworking departments are, obviously, just as important as the machine shops, and to those engaged therein probably more interesting. The work in this department has to be accurate, and special knowledge is also necessary in cutting up the material so that the grain of the timber is arranged in the finished product to give maximum strength.

The timber used in aircraft framework is chiefly ash and silver spruce. The ash trees are sent to the sawmills of our aircraft manufacturers in lengths varying from 16 feet to 18 feet, where they are there cut up into planks varying from 1½ inches to 3 inches in thickness, by means of a powerful log-sawing machine, arranged with the saw working horizontally.

The planks are then taken to the drying shed, and stacked or skidded, so that the air can freely circulate around and absorb the moisture. The old practice of allowing timber about eighteen months to season has been cut down to a much less number in weeks, as the demand is overtaking the supply, and artificial means are necessarily adopted to dry it quickly.

One system is to put the ash into a steam-heated drying room for a period of three to six weeks, at a temperature of 70° F., while another system, known as the Erith, is employed, which takes approximately seven days, but is much more expensive and elaborate.

The silver spruce is usually supplied cut up into planks varying from 15 feet to 40 feet in length, from 12 inches to 14 inches in width, and from 3 inches to 6 inches in thickness. These planks are also skidded in drying sheds for about six weeks, as it is of the utmost importance that the material should be thoroughly dry.

The first operation is to cut up the planks to the required lengths for the various units, by means of a cross-cut sawing machine, or pendulum swing saw, these machines being generally installed at one end of the drying shed for convenience, so that the pieces cut can be quickly passed on to the main joinery and the scrap ends thrown out.

In the main joinery shop the pieces are ripped up by means of powerful circular saws to the dimensions required in forming the units used in the building up of the framework, such as the longerons, side frames, struts, spars, ribs, etc. These units are then stacked up and allowed to remain so for a period of six weeks, in order that they may be thoroughly seasoned before any further machining is carried out. Should a piece pass on without being properly dried, the chances are it will warp, and when this takes place it is at once scrapped by the inspector.

The next operation constitutes the commencement of the real machining, the parts being passed through the planing and thicknessing machines, one of which is illustrated in Fig. 1.

The practice is to utilize one or two sizes of these planers, using the small machines for the light and thin work and the larger machines for the heavier work. The machine illustrated is a panel planing and thicknessing machine, and is designed to take timber from 7 inches to 1/16 inch thick. The frame is composed of iron castings, rigidly connected by several massive cross ties, and with the exception of the countershaft, which drives both the cutter head and the feed motion, the machine is entirely self-contained. The table is raised or lowered by power, the operating lever being conveniently placed on the right of the feeding-in end, a safety stop being provided to throw out the power feed when the table reaches its topmost position. The hand wheel on the left provides a fine hand adjustment. The cutter spindle is ground true, and revolves in substantial phosphor bronze ring oiling bearings. Two knives are usually carried to plane with a shear cut, and are set to project slightly over the lips of the cutter head. The pressures before and after the cutter head are so arranged that very short pieces of timber can be fed through the machine. One important feature is the variable feed gear, which gives any rate of feed from 12 feet to 60 feet per minute, the changes being effected by turning the hand wheel seen to the right of the feeding-in end. The feed gear is driven from the countershaft that drives the cutter head, and consists of two expanding cones with a heavy V felt running between them. The feed motion is instantly started or stopped by the lever at the left-hand side of the feeding-in end, which actuates a belt tightener, also shown on the same side of the machine. The feed rolls are four in number—two above and two below the bed—and are driven by enclosed machine cut gearing. When the timber is planed, it is subjected to the most careful inspection, and any piece with resin pockets, knots, or other defects is rejected.

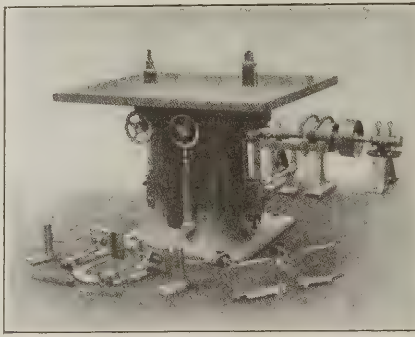


Fig. 2—Double spindle circular moulder

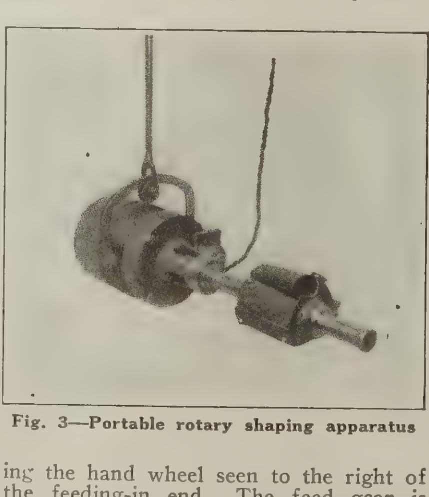


Fig. 3—Portable rotary shaping apparatus

The next machining operation is carried out on the vertical spindle circular moulding machines, which are equipped with one and two spindles.

The double-spindle machines predominate, owing to the fact that they are in general more useful than the single spindle, and the timber can be more conveniently worked when taking the grain of the material into consideration, as the spindles revolve in opposite directions.

Fig. 2 illustrates a double-spindle circular moulder, suitable for working timber up to 4 inches deep. The frame on which the cutter spindles are mounted is a single casting of substantial design and great rigidity. Each spindle is arranged to rise and fall independently by means of the hand wheels shown on the front of the machine. The ends of the spindles are made removable, so that cutter holders of different forms to suit various kinds of work can be used. The table is 4 feet long by 3 feet wide, and is, of course, machined true on the top; the spindles are 24 inches apart.

The wing and tail plane spars, which are made from spruce, have to be recessed or moulded on the sides to form an "I" girder section. This recessing work is rapidly accomplished by having a cutter of the correct form bolted on to the cutter block. The spars are fed by hand past the cutter, the exact depth of the recess being obtained by an adjustable fence or guide.

In some cases the operator prefers to work this without using the fence, and obtains the correct depth of recess by having the cutter held in a slotted cutter spindle end, which is screwed on to the main spindle. The work is fed gradually in until it touches the spindle which acts as a guide, the cutter standing out the required distance for the depth of the recess. When the recess is rather wide, it is the usual practice to cut half the width out with one spindle, and the other half with the second spindle. In the single-spindle moulding machines the cutter spindle is arranged to run in either direction, so that the recessing can be done to suit the grain of the timber.

The wing spars average about 20 feet in length, 2¼ inches wide, and 4 inches deep. They are recessed on both sides, the recessing being intermittent, because parts must be left solid where the bolt holes and the steel fittings are located.

The tail plane has a thinner section and is recessed on one side only, the recesses being also intermittent. These spars are then glued back to back, and finally form an "I" girder section. The main plane struts are also moulded on these machines in the shape of an oval section, the ends being slightly tapered by hand, or by means of a portable rotary shaping apparatus, as shown in Fig. 3. This is a handy and portable tool for shaping irregular wood surfaces, and is used to great advantage on such work as propellers. The apparatus is directly coupled to a high-speed motor of ½ b.h.p. The cutting tool consists of a solid circular cutter, about 3 inches in diameter, operating with a shear action; it is mounted on a spindle running in self-aligning double row ball bearings, carried in a gun-metal and steel casing, handles being formed on each end of the casing for controlling and supporting the apparatus. Provision is made for regulating the amount of projection of the cutter, as required for heavy or light cuts, or by the curvature of the surface to be shaped. The funnel-shaped opening on the top of the casing allows the chippings to be discharged. The shaper alone only weighs 12 pounds, but it is necessary to balance the weight of the motor. This balancing gear consists of a swivelling yoke, hinged to the motor as illustrated, and suspended from a runway above by a double rope, which passes over pulleys on an overhead trolley, and is attached to the balance weight. If electric current is not available, the apparatus can be supplied with a flexible shaft drive of simple construction. It consists of a driving head mounted on a pillar, the head being arranged to swivel to give additional range. The head is driven from a countershaft, and the spindle end is connected to the flexible shaft, which is usually about 10 feet long. The balancing gear and runway are also provided.

The final machining operation is the drilling of the bolt holes in the spars and longerons. Gigs are used, so that no marking out is necessary, and all the holes, of course, are bored accurately, so that each piece is interchangeable.

The rib centers are cut out and built up from three-ply ash, with spruce cappings.

All the machined parts are now taken to the unit assembling department, where the fuselage, center planes, main planes, tail planes, ailerons, and elevators are assembled in specially designed jigs. The metal fittings are fixed and the tension wires put on and just tightened sufficiently for these units to be tested for alignment, etc. The tightening up of the tension wires is a delicate operation, and requires considerable skill as well as experience, as of course each wire must be at the correct tension.

The complete units being inspected and all adjustments necessary made, they are then passed on to the paint shop to be varnished, and when dry are returned to the former department, where the planes, ailerons, and elevators are covered with fabric—usually pure linen. The linen is cut up to the required lengths and shape and is sewn on by women workers, who are now thoroughly accomplished and do very good work.

All these parts are then taken to a special department, where the fabric is treated with "dope." This liquid is painted on with a brush by hand, and the linen is given several coats. The time allowed between each coat is some hours. The idea of treating the fabric in this way is to tighten it up and give it a coating or skin that will protect it from the weather. In this department the temperature is always maintained at 70° for drying purposes, and to protect the workers against the obnoxious fumes from the painting operation, the air is changed thirty-six times per hour by mechanical means. The fumes, being heavier than the air, fall to the ground.

When the fuselage is assembled and trued up, it is carefully inspected and the alignment tested in every way. This is carried out by means of a central line, as the slightest deviation makes itself felt in the flying of the machine. This alignment test is carried out by one of our well-known manufacturers in the following manner: The fuselage or body is set up so that the part of the longerons just above the engine bed is perfectly level, lengthwise and crosswise, as they are at this point parallel to the center line of the engine. At any section in the length the body should be rectangular, and if not, adjustments are made by the cross bracing wires. The tubular stern post should be perfectly vertical with the body in the above position, and is tested by means of a plumb line. The test for seeing whether the body is perfectly symmetrical for the whole of its length is accomplished in the following manner: A straight-edge about 5 feet or 6 feet long, is set across the front body struts, and two points marked off equidistant from the center line of the body. From these points, measurements are taken to the center of the stern post, and if these distances differ, the horizontal bracing wires are adjusted until they are equal. Another test is to place a straight round bar through the tubular tail socket at the rear of the body, and mark off two points equidistant from the center line. The distance from these points to those on the straight-edge at the front should be equal. If not, adjustments are made by the cross bracing wires.

Final Erection

We now come to the final erecting of the machine. The body is mounted on its carriage, the main planes are then fitted to the body, and the dihedral angle tested. The wings of an aeroplane are said to be at a dihedral angle when both right and left wings are upwardly or downwardly inclined to a horizontal transverse line. The angle is measured by the inclination of each wing to the horizontal. If the inclination is upward, the angle is said to be positive; if downward, negative.

The angle of incidence is the angle a wing makes with the direction of its motion relatively to the air. The angle is usually measured between the chord of the wing and the direction of motion. When adjusting the main planes, the incidence, stagger, and dihedral will have to be constantly checked, one against the other, for any alteration to one may affect the adjustment of the others. The stagger of the planes means the distance the leading edge of the upper plane should project in front of the leading edge of the lower plane throughout the whole length. When these adjustments have been made and checked, the leading edges of the main planes must be squared with the center line of the body. The tail plane with its elevators is now fixed and adjusted, so that the leading edge is square with the center line of the machine and parallel to the top body rail. The rudder is placed in position, and should be vertical and parallel to the line of flight.

The controlling organs of the aeroplanes are, of course, the rudder, the elevators in the tail plane, and the ailerons or balancing flaps in the main planes. All these are controlled by means of levers and connecting cables from the cockpits, or pilot seats. When these controlling levers are set in their vertical positions, the various organs by which the machine is operated should, of course, all be neutral positions.

When the final aligning of the machine has been completed, it is carefully checked at all points, and note taken that all turnbuckles are locked and have a secure hold on the barrels. Special attention is given to see that all turnbuckles on the control cables are locked, and all split pins which lock the nuts on the bolts are opened out.

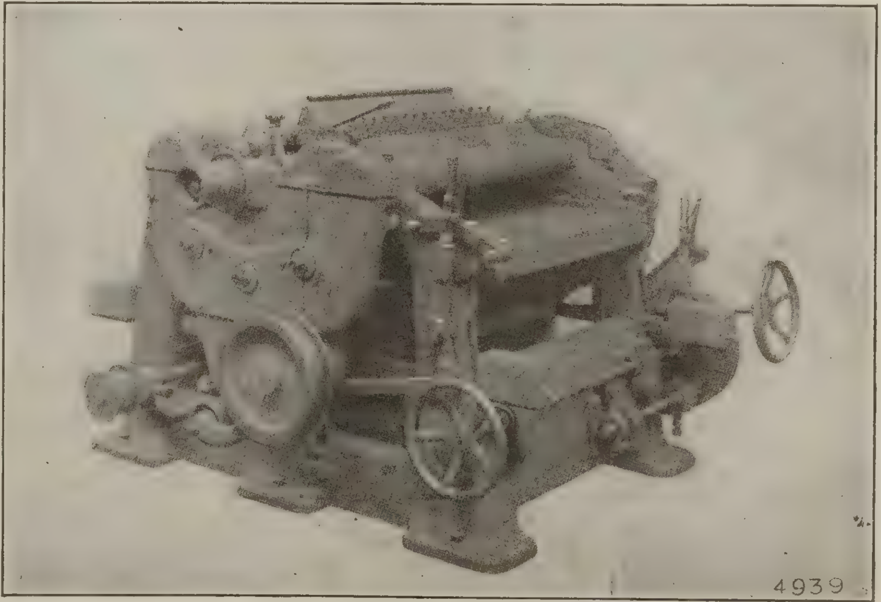


Fig. 1—Panel planing and thicknessing machine

THE FRIEDRICHSHAFEN 450 H. P. GOTHA II FIGHTING AND BOMBING BIPLANE[*]

THE Fliegenblau Friedrichshafen Gesselshaft are well known as the constructors of the Zeppelins, but it is not generally known that they have also turned out many single- and twin-engined seaplanes, for which their works, on the shore of Lake Constance, are well adapted. They are also responsible for a large output of scouts and bombing machines, including the Gotha, type II., more especially of late, since the construction of Zeppelins has recently been considerably moderated for reasons that are only too obvious.

M. Lagorgette, to whom we are indebted for details of the F. F. Gotha II. captured on the French front, states that this machine is merely a modification of their big seaplane, which is not quite correct, as it is evidently based more on the lines of the Erfurt Gotha. It is believed to have taken part in the raids on London and Paris, but, owing to the great height and the small difference in size and appearance from the Gotha, identification is very difficult and unreliable.

The span of the upper planes is 12 feet less than the Gotha, and the sweep back is the same, about 3°. The central portion has neither sweep back nor dihedral angle, and the top and bottom planes are slightly unequal, owing to the arrangement of the Vee engine struts and nacelles, and are set at a small dihedral angle of 2° with a slight stagger. The tips are raked with rounded angles and the tips of the ailerons project forward beyond the tip of plane, similar to the Gotha, and both types are pushers, which necessitates cutting away the central portion of the trailing edge and reducing the chord to allow for clearance of the propellers.

Each motor is mounted on Vee steel tube struts running from the lower to the upper plane, and enclosed by the nacelles, and braced to the fuselage by steel tubing. There are two pairs of interplane struts on each side fixed at a slight outward angle, and the leading edge of top plane projects slightly in front of lower plane, and is braced by diagonal wires fixed to the lower ends of the outer pair of interplane struts.

There is a marked difference in the position of the ribs. Unlike the Gotha, they are fixed parallel to the axis of the fuselage, while in the Gotha they are at right angles to sweep back and leading edge, and are therefore at an angle with line of flight and axis of fuselage.

The tail plane is different from the Gotha, having a greater length and with the rudder is a return to the Albatross type. The rudder of the Gotha is more square, the front and rear edge being parallel, while the rudder of the F. F. Gotha II. is triangular. The fin is triangular and slightly rounded off on to the fuselage in front, similar to the English types of machines. The elevators and rudders are balanced and constructed of steel tubing very similar in manner to the Gotha.

The fuselage is rectangular in section, and the upper surface is parallel with line of flight, or horizontal when the machine is balanced or in equilibrium. The gunner's cockpit is placed in front with revolving gun ring, and immediately behind is placed the pilot's cockpit; behind this is the petrol tank between the two bomb racks, one on each side, with release gear. In the rear is the second gunner's cockpit, with gun ring, connected with trap-door behind, in bottom fuselage, though which the gunner is enabled to fire downwards or backwards at enemy machines.

Contrary to the usual German practise, the landing carriages are formed of two vertical struts with a diagonal rear strut fixed to base of fuselage, on which are mounted the axle and pair of wheels of rather a narrow track. The rubber shock-absorbers are of the usual German type. There is also a large stream-lined horizontal skid, the front and rear ends of which are fixed to two vertical steel tube struts, which are fixed to the base of Vee struts, which support the engine.

The tail skid is constructed of ash tipped with a steel shoe, and is fixed to a vertical steel tube running up and built into the fuselage.

The motors are mounted between two pairs of Vee struts connecting upper and lower planes, and each of the Benz engines is enclosed in a boat-shaped nacelle stream-lined to a pointed cap and boss behind, to which is fixed the propeller.

The radiator is of the honeycomb type, and is placed in front of the engines, which are a pair of Benz 225-h.p. six cylinders, developing the maximum power at 1,400 r.p.m.

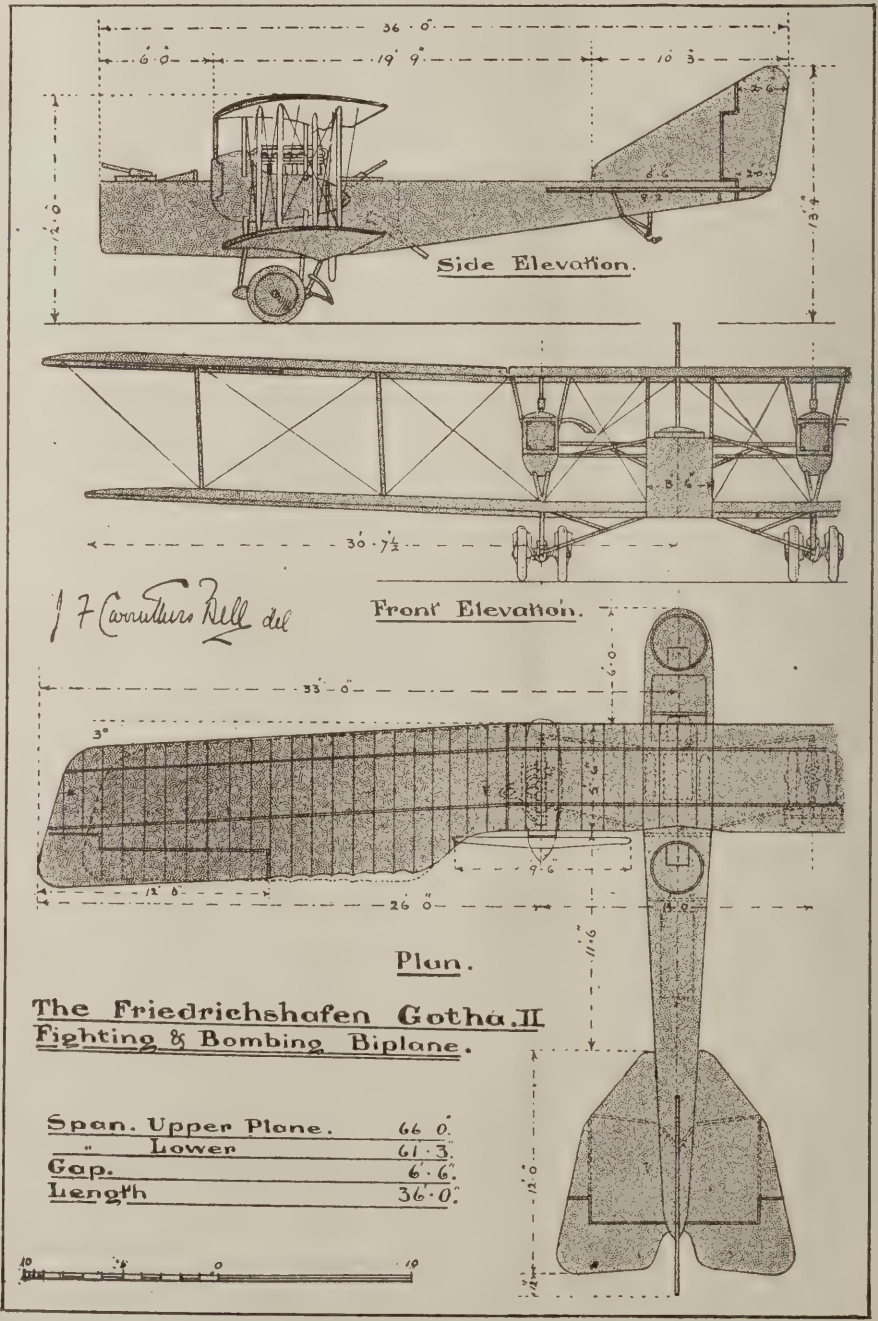
The petrol tank, together with the two gravity tanks, have seperate feeds, and have a capacity of 124 gals.

The bomb chambers are similar to the Gotha, and each chamber carries six bombs, and four incendiary bombs are carried under the fuselage horizontally one over the other, supported by steel clips.

The machine carries fuel for four hours' flight. The following are the approximate weights:—

	lbs.	lbs.
Weight of machine..................		4,300
Useful load, pilot and two........ gunners..............................	500	
Fuel	1,000	
Oil	200	
Guns, bombs, etc..................	800	
	——	2,500
Total load..............		6,800

The total wing area is 700 sq. ft.; this gives a load of 9¾ lb. sq. ft. of wing area, and a fraction over 15 lb. per horse-power. The wing loading appears to be excessive, but is in a measure counterbalanced by the moderate load per horse-power.



The Friedrichshafen Gotha II Fighting & Bombing Biplane.

Span. Upper Plane.	66 0.
" Lower	61 · 3.
Gap.	6' · 6".
Length	36' · 0".

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[*] Courtesy of "Flying"—London

CALCULATION OF STRESSES IN AEROPLANES

By S. E. SLOCUM, Ph.D.
Professor of Applied Mechanics, University of Cincinnati, Member S. A. E.

THE brief history of aviation up to the present time has been mainly a record of experimental achievement, as it is always necessary to determine the physical constants involved in a scientific problem of this nature before mathematical analysis can be applied to it. Such experimental research is now well systematized, and there are at present a considerable number of laboratories both in this country and abroad devoting their entire time to scientific research in aerodynamics. There has also been considerable advance made in the mathematical theory of aviation, such for instance as the work of Bairstow and Wilson, but much of this work is not yet generally accessible, while a large part of it is too highly technical to be within the grasp of those who are otherwise qualified for practical accomplishment in aeronautical work.

Under the pressure of military necessity the efforts of manufacturers and others interested in aviation have been concentrated on production, and there has been practically no attempt to educate the average engineer or layman interested in this line of work in the principles of aeroplane construction. Before aviation can become a standardized branch of engineering, however, it is necessary that a knowledge of the principles of construction and operation of aircraft be generally diffused. At present production of aircraft is, of course, paramount, but the future development of aviation depends largely on giving those not now specifically engaged in this line of work an intelligent understanding of the mechanics of aviation.

The object of the present paper is to add a small contribution to what has already been done in this line of explaining as simply as possible the four main items involved in the design of aeroplanes, namely,

1. The distribution of load;
2. The analysis of stresses in the spars;
3. The analysis of stresses in the lift and drift trusses;
4. The analysis of stresses in the fuselage trusses.

Principal Dimensions

The type of machine considered, as shown in Figure 1, is an American biplane, which is sufficiently standard to be suitable for purposes of analysis, although this particular model is not fast enough to meet war requirements.

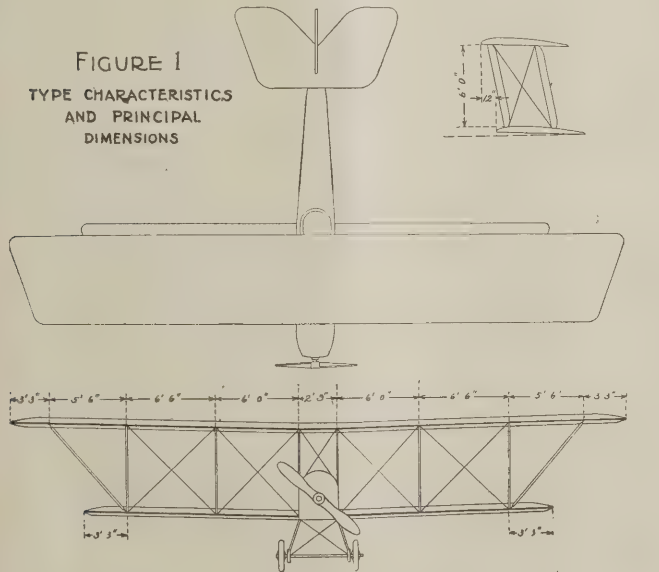

FIGURE 1
TYPE CHARACTERISTICS AND PRINCIPAL DIMENSIONS

The principal data needed for calculation are as follows:—

Total loaded weight, 2,000 lbs.
Total wing area, including ailerons, 472 sq. ft.
Weight of wings alone, 0.75 lbs. /ft².
Total weight of wings, 472 x .75 = 354 lbs.
Span of wings, 45' 3".
Chord of wings, 6' 6".
Gap between wings, 6' 6".

Type Characteristics

The principal structural features of the types of aeroplanes under consideration have all been determined from the results of experiments.

The chief characteristic is the aspect ratio, which is defined as

$$\text{Aspect ratio} = \frac{\text{Span of wing}}{\text{Chord of wing}} = \frac{45'\ 3''}{6'\ 6''} = 7.$$

The interplane truss (or "lift truss" as it is called), shown in front elevation in Figure 1, is the Pratt truss, long used by bridge engineers, and introduced into aeroplane construction by the well known American bridge engineer, Octave Chanute. The overhanging type of construction, formed by shortening the lower planes, was introduced by Henry Farman, one of the pioneers in aviation in France.

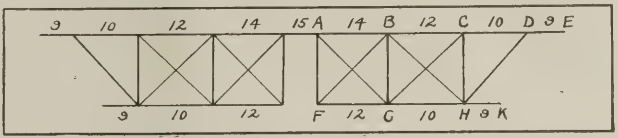

Figure 2. Relative proportions of panel loads

This braced girder type of construction seems to have the advantage in point of lightness and simplicity over any other form of construction of equal strength. The diagonals are wire, one set being stressed when the plane is in normal flight, and the other system being in action when the plane is resting on the ground, or flying in an inverted position.

The unequal panel length is a French invention, the effect of shortening the panels adjoining the fuselage being to reduce the stresses near the center; that is, to distribute the stresses more uniformly throughout the truss. In the present case the stresses could be reduced somewhat by making the panel AB say 6" shorter and adding this 6" to the next panel BC.

The reason for giving the upper plane a greater spread than the lower is because it has been found by experiment that the upper plane is more efficient that is it exerts a greater average lift, than the lower. This decrease in effective lift of the lower plane is due partly to the interference with the air currents produced by the fuselage, which is placed in the middle where the lift would otherwise be a maximum, and partly to the influence of the upper plane, which deflects the air currents downward on top of the lower plane, thereby partially reducing the suction, or negative pressure, on this surface. In general, it has been found that the upper wing of a biplane carries from 0.6 to 0.8 of the total load. The most efficient spacing for a biplane has been found by experiment to be when the gap between the wings is approximately equal to the chord of the wings.

The object in staggering the planes, that is, in placing the upper plane in advance of the lower, is to improve the lift of the upper plane, as experiments seemed to show that this construction increased the efficiency of the upper plane as much as 5 per cent. This conclusion, however, does not seem to be verified by recent experiments.*

The use of a trapezoidal form of wing with the short edge leading has been found to decrease the head resistance, or drift, somewhat, as compared with that for a wing of rectangular plan.

Distribution of Load

It has been found by experiment that besides the positive pressure on the under surface of an aerofoil, or wing, there is also a negative pressure, or suction, on the upper surface of the wings. The latter in fact is more important than the pressure on the surface directly exposed to the wind, making it necessary to attach the covering solidly to the back of the wing. For present purposes, however, we are only concerned with the total lift exerted on a unit area at any point, which is the numerical sum of the positive and negative pressures at this point.

It has also been found by experiment that the lift, or wing loading, for an aerofoil of constant cross-section varies along the span, being greatest at the center and falling off towards either end. The ratio of the loading per unit area at the center of the span to that near the wing tips has been found to depend on the aspect ratio of the aerofoil and also on its plan form, being smaller for the larger aspect ratio, and also smaller for wings with rounded tips.

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* See monograph by L. Marchis included in the Second Annual Report of the National Advisory Committee for Aeronautics, 1916.

In the present case the total load supported is 2,000 pounds, of which the weight of the wings alone is 354 pounds. Since the wings are self supporting so far as the truss system is concerned, the stresses in the wing spars and lift trusses are calculated from the net load supported, namely 2,000 — 354 = 1,646 pounds. Since the total area of the planes is 472 sq. ft., the average load per sq. ft. of supporting surface is

$$\text{Average net lift} = \frac{1646}{472} = 3.487 \text{ lbs. per sq. ft.}$$

Considering the total weight lifted, the average is $\frac{2000}{472} = 4.24$ lbs. per sq. ft. This may be compared with the average lift for biplanes in general, which usually lies between 3 and 6.5 lbs. per sq. ft.

To determine the actual unit load for each panel, it is necessary to take into account the variation of lift along the span, as mentioned above. For the type under consideration this variation in pressure along the span may be represented by the numbers indicated in Figure 2, these numbers representing the relative proportions of the loading in the various panels. For example, the upper wing panel on either side of the center is assumed to carry $\frac{14}{15}$ as much load per sq. ft. as the center panel; while the panels at the tips of the wings carry $\frac{9}{15}$ as much per sq. ft. as the center panel, etc.

To find the unit load in each panel, let x denote the unit load for the center panel of the upper wing. Since the area of this panel is 2.75 × 6.5 = 17.875 sq. ft., the total load supported by it is 17.875x. Since the unit load on each of the adjoining panels is $\frac{14}{15}x$, and the area of these panels is 39 sq. ft. each, the total load supported by them is $2 \times \frac{14}{15}x \times 39$, etc.

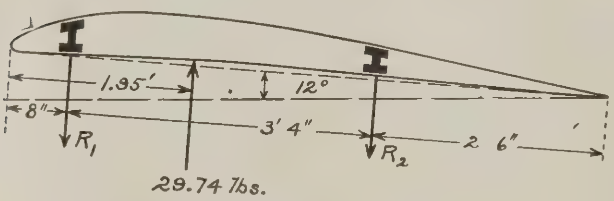

Figure 3. Resultant pressure and spar reactions

Therefore equating the total load supported by both wings to the net load carried, we obtain the equation

$$x\,[17.875 \times 2 \times \frac{14}{15} \times 39 + 2 \times \frac{12}{15} \times 42.25 + 2 \times \frac{10}{15} \times 35.75 + 2 \times \frac{9}{15} \times 14.625 + 2 \times \frac{9}{15} \times 14.625 + 2 \times \frac{10}{15} \times 42.25 + 2 \times \frac{12}{15} \times 39] = 1646$$

whence

$$x = 4.575 \text{ lbs. per sq. ft.}$$

$$\frac{14}{15}x = 4.270 \text{ lbs. per sq. ft.}$$

$$\frac{12}{15}x = 3.660 \text{ lbs. per sq. ft.}$$

$$\frac{10}{15}x = 3.050 \text{ lbs. per sq. ft.}$$

$$\frac{9}{15}x = 2.745 \text{ lbs. per sq. ft.}$$

which gives the unit loading in the various panels. According to this distribution, therefore, the upper plane carries 1022.5 lbs., or about 62 per cent of the net load. Including the weights of the planes themselves, the upper plane carries 1233 lbs., or 61 2/3 per cent of the total load.

Panel Loads on Front Spar

It is perhaps unnecessary to explain that the wings are built on two longitudinal members called spars, which carry a system of transverse ribs over which the fabric is stretched, and that the lift trusses connect the spars of the upper and lower wings. As the load is carried by the ribs to the spars and thence into the truss system, it is necessary to determine the load per running foot of spar. This, however, varies with the angle of inclination of the plane. That is to say, the center of pressure on the wing depends on its angle of incidence, by which is meant the angle which the chord of the wing makes with the direction of motion. As the angle of incidence increases, the center of pressure moves towards the leading edge of the plane, thereby increasing the load on the front spar and diminishing the load on the rear spar. Experiments do not fully agree on the location of the center of pressure for all angles of incidence, but within the narrow limits met in normal flight, the following tabular values, given by the English authority A. W. Judge, are sufficiently exact for all practical purposes.

Angle of Incidence.	Distance of Center of Pressure from Leading Edge.
0°	0.5 of Chord
2°	0.4 of Chord
6°	0.33 of Chord
12°	0.30 of Chord

To obtain the maximum load on the front spar, an angle of incidence of 12 v/o will be assumed. The center of pressure will then be at .3 × 6.5 ft. = 1.95 ft. from the leading edge.

Now consider the center panel of the upper wing, and take a transverse strip of this panel one foot in width. The area of this strip will then be 6.5 sq. ft., and the total load on it will be 6.5 × 4.575 = 29.74 lbs., which may be considered as concentrated at a point 1.95 ft. from the leading edge, as just explained. Representing the reactions of the front and rear spars by R_1 and R_2 respectively, as shown in Figure 3, we find by taking moments that $R_1 = 18.3$ lbs. Since we are considering a strip one foot wide, this reaction represents the load per running foot on the front spar. Using the proportions indicated on Figure 2, we then have the following values:—

Loads on Front Spar.

Center panel	18.3 lbs. per linear foot.
4th panel from either end	$\frac{14}{15} \times 18.3 = 17.08$ lbs. per linear foot
3rd panel from either end	$\frac{12}{15} \times 18.3 = 14.64$ lbs. per linear foot.
2nd panel from either end	$\frac{10}{15} \times 18.3 = 12.20$ lbs. per linear foot.
End panels	$\frac{9}{15} \times 18.3 = 10.98$ lbs. per linear foot.

Bending Moments in Spars

Both upper and lower spars are hinged at their point of attachment to the center panel, or fuselage, namely at the points lettered A and F in Figure 1. The upper spars therefore must be treated as a continuous beam of four spans, and the lower spars as a continuous beam of three spans. Since the spars are hinged at A and F, the moments at these points are zero. Also since the wing tips DE and HK act like simple cantilevers, the moments at D and H are

$$M_d = M_h = 10.98 \times 3.25 \times 1.625 = 58 \text{ ft. lbs.}$$

To determine the moments at the intermediate points B, C and G it is necessary to apply the theorem of three moments for continuous beams.* This may be stated as follows:—

Let M_1, M_2 M_3 denote the moments at three consecutive supports of a continuous beam, l_1, l_2 denote the lengths of the two spans considered, and w_1, w_2 the uniform load per foot on these spans. Then the following relation always exists:—

$$M_1 l_1 + 2M_2 (l_1 + l_2) + M_3 l_2 = \frac{w_1 l_1^3 + w_2 l_2^3}{4}.$$

In the present case, consider first the upper front spar, and write the theorem of three moments first for the three supports A, B, C, and then for the three supports B, C, D. We thus obtain the following equations

$$6M_a + 2M_b (6 + 6.5) + 6.5\ M_c = \frac{17.08\ (6)^3 + 14.64\ (6.5)^3}{4}$$

$$6.5M_b + 2M_c (6.5 + 5.5) + 5.5M_d = \frac{14.64\ (6.5)^3 + 12.20\ (5.5)^3}{4}$$

Since $M_a = 0$ and $M_d = 58$ ft. lbs., these two equations involve only the two unknowns M_b and M_c. Solving simultaneously for these two unknowns we find

$$M_b = 69 \text{ ft. lbs.},\ M_c = 31 \text{ ft. lbs.}$$

For the lower front spar it is only necessary to apply the theorem of three moments once, giving the equation

$$6M_f + 2M_g (6 + 6.5) + 6.5M_h = \frac{14.64\ (6)^3 + 12.2\ (6.5)^3}{4}$$

Since $M_f = 0$ and $M_h = 58$ ft. lbs., the only unknown in this relation is M_g, which is found to be

$$M_g = 50 \text{ ft. lbs.}$$

Reactions at Panel Points

Having determined the bending moments in the upper and lower front spars, the reactions at the panel points may next be found. Consider first the upper spar, and begin at the right end. Taking a section through C, the moments and forces acting on the part C E cut off are as shown in Figure 4. Denoting the rection at D by R_d and taking moments about C we obtain the equation

$$10.98 \times 3.25 \times 7.125 + 12.2 \times 5.5 \times 2.75 - R_d\ 5.5 = 31,$$

whence

$$R_d = 74.2 \text{ lbs.}$$

Next take a section through B and write the moment equation for the part on the right of the section, as indicated in Figure 5, giving the equation

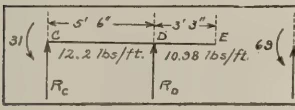

Figure 4

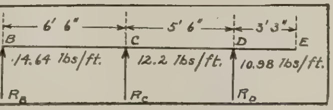

Figure 5

$$10.98 \times 3.25 \times 13.625 + 12.2 \times 5.5 \times 9.25 + 14.64 \times 6.5 \times 3.25 - 74 \times 12 - R_c \times 6.5 = 69,$$

whence

$$R_c = 70.4 \text{ lbs.}$$

Proceeding similarly for the other reactions, we find

$$R_b = 116.2 \text{ lbs., and } R_a = 47.0 \text{ lbs.}$$

For the lower front spar the results are

$$R_h = 76.6 \text{ lbs.},\ R_g = 90.7 \text{ lbs.},\ R_f = 35.6 \text{ lbs.}$$

Stresses in Lift Truss

From the reactions just found the stresses in the lift truss connecting the upper and lower front spars may be found. In normal flight only the diagonals FB and GC are stressed. Beginning at D, the forces meeting at this point are as shown in Figure 6. From the conditions of equilibrium, namely

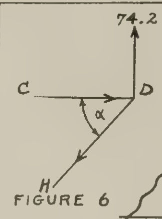

FIGURE 6

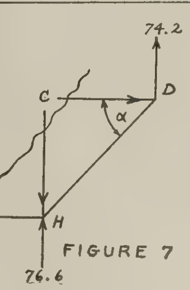

FIGURE 7

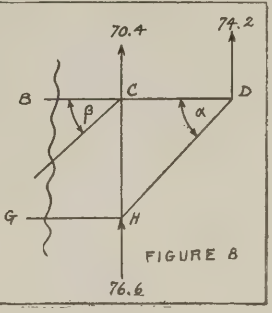

FIGURE 8

$$\text{Sum of horizontal force components} = 0$$

and

$$\text{Sum of vertical force components} = 0$$

which are usually written simply as $\Sigma H = 0$ and $\Sigma V = 0$, we have

$$DH \sin \alpha = 74.2$$

whence $DH = 101$ lbs.

Also $CD = 74.2 \tan \alpha$

whence $CD = 68$ lbs.

Now take a section diagonally through the panel CRHG, as shown in Figure 7, and apply the condition that the stresses in the members cut must equilibrate the external forces on one side of the section. In the present case applying the condition $\Sigma V = 0$, we have

$$CH = 76.6 + 74.2 = 151 \text{ lbs.},$$

and similarly from $\Sigma H = 0$ we have

$$GH = CD = 68 \text{ lbs.}$$

Now proceed by taking a section vertically through the panel BCHG, as shown in Figure 8, and again apply the principle that the internal and external forces must equilibrate. Then from $\Sigma V = 0$ we have

$$GC \sin \beta = 70.4 + 74.2 + 76.6$$

whence $GC = 326$ lbs.

while from $\Sigma H = 0$ we have

$$BC = GH + GC \cos \beta$$

whence $BC = 308$ lbs.

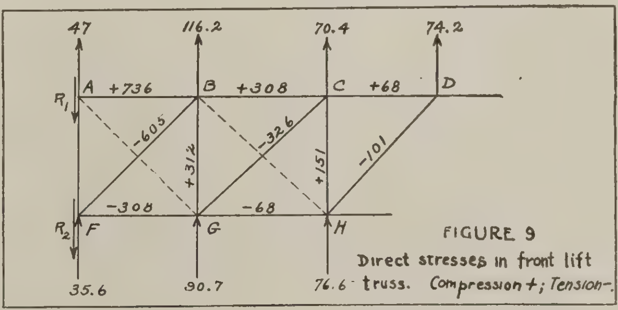

FIGURE 9
Direct stresses in front lift truss. Compression +; Tension -.

Proceeding in this manner we finally obtain all the stresses in the lift truss, the results being as indicated on Figure 9.

(*To be continued.*)

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* An elementary proof of this theorem, without calculus, was published by the writer in *Engineering News*, Feb. 19, 1914, and is also given in Chapter 6 of his book on "Resistance of Materials," published by Ginn & Co.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1.—Report to points named in order given.

Note 2.—Report to Construction Company, Fort Wayne, Mich.

Note 3.—Report to General Supply Depot, Omaha, Neb.

Note 4.—Report to Capt. Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 5.—Report to Signal Corps Recruit Bureau, Fort Wayne, Mich.

Note 6.—Report to General Supply Depot, Atlanta, Ga.

Note 7.—Report to District Manager of Equipment, Chicago, Ill.

Note 8.—Proceed to Sutton, W. Va.

Special Orders No. 100-104, Inclusive

A

Allen, Clyde H.	SLR
Arnold, George	SLR
Atterbury, John C.	SLR; WAC
Atchison, Thomas C.	FRF
Arnold, Leslie P.	FRF
Alliason, Albert Rainhold	SLR; HHN
Anderson, Samuel H.	FRF
Ames, George R.	ASM
Allen, Clyde Milton	SLR; PWM
Anderson, Karl Herman	SLR; PWM
Ainsworth, Cyril	DIK
Alvey, Paul	SMM
Adams, Chester A.	EOT
Allen, Albert A.	DIK
Atkins, Harry C.	FRF
Abbott, Louis H.	FRF
Arnold, Ivan T.	DIK
Ade, Guy W.	KST
Appleton, Francis Von L.	SLR
Armstrong, Noel	SLR
Anglescy, James J., Jr.	SLR
Allen, George B.	DIK

B

Beck, George C.	DIK
Bowen, Clark G.	DIK
Bacon, Max E.	DIK
Baisley, Herbert K.	DIK
Blee, Harry H.	ADO; WCS
Baildon, John K.	PFO
Bartlett, Treefley F.	PFO
Beresford, Paul C.	PFO
Biggs, Frederick P.	PFO
Blackard, Charles G.	PFO
Blackburn, Lloyd C.	PFO
Buckley, Francis J.	PFO
Barcklow, John C.	SLR
Butler, Frederick W.	SLR
Bogan, Paul A.	DIK
Block, Harold C.	DIK
Blackman, Clifford L.	DIK
Baird, Chester A.	DIK
Bowman, Lawrence J.	FRF
Blake, Roland G.	HHN
Bassett, James W.	FRF
Berkeley, Scot B.	DIK
Boyle, George L.	DIK
Buchanan, Thomas S.	DIK
Borden, Frank K.	FRF
Brooks, Merrill F.	DIK
Brackett, Edward T.	DIK
Brush, Oliver G.	FRF
Batson, Shelby H.	FRF
Brothers, William F.	FRF
Behncke, David L.	FRF
Bloom, Edward L.	FRF
Baker, Samuel Fairfax	SLR; PWM
Bohen, Mark Damon	SLR; WAC
Bollman, Frank G.	SLR
Brown, Lewis F.	SLR
Barrett, James R.	SLR
Barrington, Francis	SLR; CJW
Blum, Clarence A.	SLR
Burns, John L.	SLR
Bush, Bradford Stetson	SLR; KST
Berglund, Carl Roy	SLR; WAC
Bradley, Addison Ballard	SLR; WAC
Boswell, James G.	RSD
Barratt, Milton	SLR; EOT
Burton, James, Jr.	SLR; EOT
Burnight, Ernest R.	FRF
Briggs, Martin Calkins	SLR; VBW

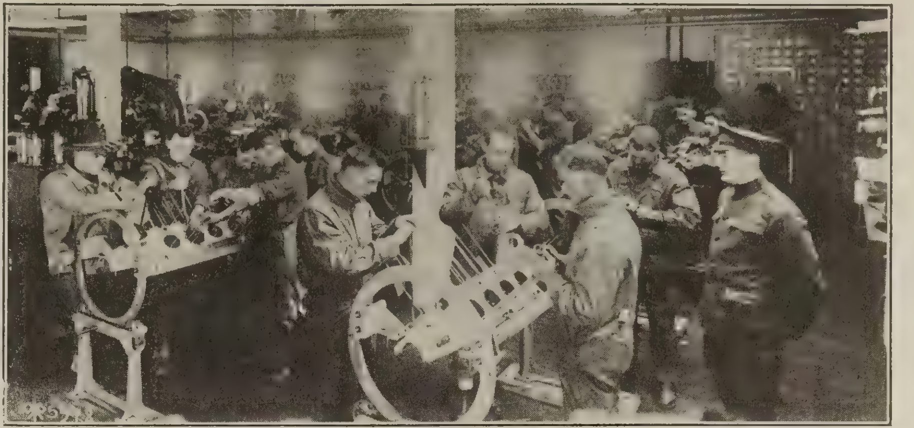
Bollman, Frank George	SLR; WAC
Bond, John D.	RTR
Brooks, John P.	SMM
Bealmer, William C.	SMM
Bergh, James R.	EOT
Bradford, Thomas L., Jr.	EOT
Brown, Ray B.	EOT
Byington, Marsh M.	EOT
Blankenship, Robert Edward	SLR; EOT
Bryson, W. S.	RTR
Bush, Roland A.	FRF
Barthen, Theodore	VBW
Bedford, Clayton O.	ASM
Blockinger, Carl H.	WAC
Beall, Henry I.	AGC
Brouilliard, B. W.	RTR
Burrucker, William	DIK
Browne, Charles E.	DIK
Bailey, Raymond L.	SLR; CWT
Barnes, Harold L.	SLR; CWT
Bastow, Joseph G.	SLR; CWT
Bilheimer, Earl L.	SLR; CWT
Baer, George Van Dusen	SLR; KST
Barnes, Lionel H.	SLR; KST
Barrall, Arthur D.	SLR; KST
Bell, Ned Carr	SLR; KST
Berry, Guy Leonard	SLR; KST
Blackwell, Clarence Wakoman	SLR; KST
Bogardus, George Whitfield	SLR; KST
Bogert, Merlo William	SLR; KST
Bond, Norman James	SLR; KST
Branine, Harold Rigby	SLR; KST
Browning, Robert LeWright	SLR; KST
Brugman, William Joseph	SLR; KST
Brundage, Wilbur	SLR; KST

C

Clapp, Charles Gardiner	SLR; CJW
Cone, Edmund L.	SLR
Cornell, Donald S.	SLR
Cranford, Russell A.	SLR; RSD
Cheney, Moses E.	SLR; CSO
Connolly, Allen H.	SLR; Note 2
Craig, Carl C.	SLR; WAC
Collett, William B.	FRF
Carner, Whitehurst M.	FRF
Crowe, Walter A.	SLR; SB1
Chisum, Yenner Y.	WAC
Coffee, Harry Buffington	SLR; WAC
Corrington, Julian Dana	SLR; WAC
Clagett, Henry B.	RSD
Carter, Clarence Leroy	SLR; EOT
Crippen, John H.	FRF
Chaflin, Stephen T.	FRF
Cutler, Sewall	AGC
Cotton, Charles S.	AGC
Culver, Howard P.	HHN
Caffery, James P.	AFO
Craig, John W.	SLR; EOT
Cooper, Walter W.	EOT
Caldwell, Joe H.	EOT
Callender, Alfred R.	EOT
Cabell, Philip F.	EOT
Cohen, Abraham P.	EOT
Cook, Charles I., Jr.	EOT
Clapham, William P.	CSO
Cary, George A.	SLR; KST
Carroll, Harry Michael	SLR; KST
Christopher, Donald	SLR; KST
Cleland, Dewitt	SLR; KST
Cline, William Henry, Jr.	SLR; KST
Conaty, Bernard Martin	SLR; KST
Cox, George Howland, Jr.	SLR; KST
Cunningham, John Redmond	SLR; KST
Coates, William T.	DIK
Carter, Harry W.	DIK
Compere, Harold	FRF
Cannon, George	FRF
Chaffee, Raymond O.	FRF
Cochran, Thomas B.	FRF
Cameron, Brinton M.	KST
Cotter, Chester	KST
Cannon, Thomas O.	SLR
Clark, Smith Duv.	SLR
Cargo, Hugh G.	SLR
Cottrell, Clifton C.	SLR
Cloyd, Bart R.	DIK
Campbell, William M.	DIK
Curran, Cyril J.	FRF
Chilton, Ralph H.	PFO
Cohen, Abraham P.	DIK
Crippen, John H.	DIK

D

Dennis, Donald W.	SLR; EOT
Dougherty, Michael Joseph	SLR; WAC
Deere, Gilbert DeMorest	SLR; WAC
Durkin, Emmet James	SLR; WAC
Durston, Harry Cranston	SLR; WAC
Dietrich, Richard H.	SLR; CWT
Daley, Walter F.	SLR
Davis, Earl A.	SLR; RSD
Denbo, George W.	SLR
Dawson, Athol A.	FRF
Dyett, Walter F.	RTR
Dixton, Jerome John	SLR; KST
Dunlap, Edwin W.	AFO
Dahman, Wallace W.	DIK
Dine, Herman J.	DIK
Dixon, Jerome J.	EOT
Dodd, Spencer S.	SLR; EOT
Dudley, John E., Jr.	EOT
Duffield, LeRoy B.	EOT
Dugas, Graham C.	EOT
Duke, Leslie B.	EOT
Dauchy, Theodore M.	SMM
Darby, Alexander L.	AFO
Doyle, John C.	PFO
Duncan, Floyd R.	PFO
Dunton, Gardner	PFO
Doutt, Robert H.	REV; CSO
Davey, John A.	SLR
Davis, Kenneth M.	SLR
Denny, Archibald M.	SLR
Denie, George R.	SLR
Dade, Alexander L.	RTR
Dayton, James W.	DIK
Donnelley, Clarence E.	DIK
Dudley, William M.	DIK
Dike, Clyde E.	FRF
Dobbs, Silas A.	DIK
Decker, Kenneth N.	DIK



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Students of the Engineering School at Mineola, L. I., being taught aeroplane motor construction and assembling

E

Eccleston, Henry Bennett	AAD
Eichelberger, Raymond T.	SLR
Everett, Edward C.	FRF; DIK
Evans, Thomas R.	FRF
Eaton, Alfred V.	FRF; DIK
Ensign, Harry Asher	SLR; KST
Ervin, James R.	AGC
Easley, Sam A., Jr.	DIK
Ernst, Norman C.	EOT
Ewing, Hugh W.	SLR; DIK
Enlow, Charles R.	SLR; DIK
Elliot, Kerley C.	DIK
Ebert, Solomon B.	SLR
Edwards, Claude R.	PFO

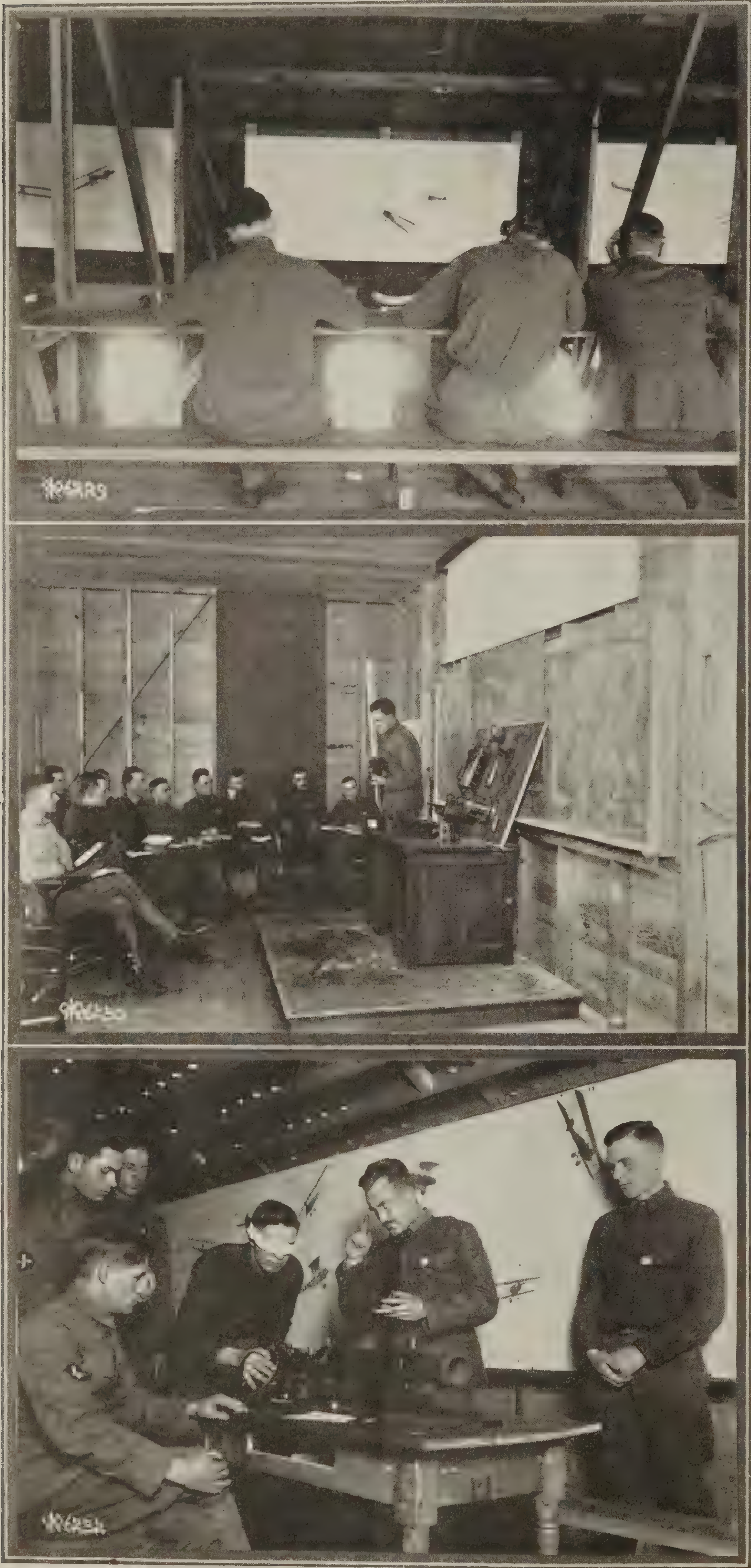
F

Fanshawe, John Edmund Jones	SLR; WAC
Freston, Herbert August	SLR; WAC
Field, William P.	OSU
Fitzkee, Adam H.	FRF
Fitzmaurice, William J.	FRF
Fair, John A.	SLR; PWM
Fee, Darlington E.	SLR; WAC
Fernandes, Albert H.	SLR; WAC
Frank, Stuart H.	SLR
Fairclough, Richard H.	SLR
Fredell, Edwin J.	Note 4; WCS
Fraser, Dean B.	FRF
Fowler, Robert J.	AGC
Few, Lindsey D.	EOT
Foster, Harold G.	EOT
Franklin, George T.	EOT
Franklin, Albert	SLR; LDT
Fitzpatrick, Herbert Carroll	SLR
Foster, Robert Harold	SLR
Fish, Frederick L.	SLR; CWT
Fitch, Victor W.	SLR
Fisher, Albert L.	PFO
Fendrick, Raymond S.	DIK
Fleming, Eugene C.	DIK
Fox, Russel E.	DIK
French, Howard W.	TMA
Friday, Curtis R.	DIK
Francisco, William H.	DIK
Fischer, Conrod J.	DIK
Farmer, William H.	FRF
Farthing, William E.	FRF
Fay, Samuel P.	FRF
Fraser, Dean B.	DIK

G

Galinger, George W.	SLR
Geary, Harry Oliver	SLR; AAD
Giles, Barney McK.	SLR
Grubb, Kenneth P.	SLR
Gaither, Henry G.	SLR; WAC
Gibson, Glen T.	SLR; WAC
Gillelen, Warren P., Jr.	SLR; SAG
Glover, Charles S.	SLR; EOT
Goette, Theodore Raymond	SLR; CJW
Gilbert, Lester F.	PUP
Graves, Henry Lewis	SLR; WAC
Gray, Charles Arthur	SLR; WAC
Griggs, Walter A.	DIK
Greer, John E.	SMM
Gouse, Frederick M.	Note 6; WCS
Graiczunas, Vytautas A.	DIK
Griffith, Fred C.	DIK
Greenwood, Chester L.	EOT
Grieb, William C.	ASM
Gause, George E.	SLR; CWT
Gallup, Frederick Lorenzo	SLR
Gee, Jesse J.	SLR; KST

The first group of Aviation Carpenters turned out by Dunwoody Institute, now assigned to active duty



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Teaching U. S. Student Aviators at the Signal Corps Aeronautical School, University of California

Top—Getting acquainted with radio instruments. Middle—Magneto instruction. Bottom—Assembling a Lewis Gun in seventy seconds while blindfolded.

Gilbrido, Bernard John	SLR
Graham, Edgar	SLR
Gowans, Louis L.	DIK
Guthrie, Clifford B.	DIK
Garnsey, Arlo E.	DIK
Gleason, Howard H.	FRF
Gallagher, Joseph J.	SLR
Garrison, Russell P.	SLR
Graham, Gregory N.	SLR
Greene, Frederick W.	SLR
Goldthwait, Joel A.	FRF
Gill, Hamilton A., Jr.	DIK
Gerke, Walter H.	KST

H

Hancock, William Wayne	SLR; WAC
Hager, Jonathan G.	SLR; WAC
Harris, Richard M.	SLR; TMA
Harrison, Carter Henry, Jr.	SLR; WAC
Harriman, Cliffe R.	SLR; VBW
Hart, Harry M.	SLR; HHN
Haviland, Marston	SLR; WAC
Hart, Harrison L.	SLR
Hanna, Charles G.	SLR; SAG
Henderson, Randall Thomas	SLR; WAC
Heckler, Russell G.	SLR; WAC
Heller, William B.	SLR; WAC
Hoover, Frank Woodward	SLR; WAC
Hilby, George H.	SLR; EOT
Hill, Charles C., Jr.	SLR; WAC
Howard, Pendleton	SLR; WAC
Holden, John A.	SLR; WAC
Holtzworth, Charles C.	SLR; WAC
Hunt, Everett Howard	SLR; WAC
Horne, Ellwood J.	SLR
Hodge, Alvin R.	SLR
Hawkins, Milo	SLR; VBW
Hegenberger, Albert F.	SLR
Holland, John F.	SLR
Hershman, Albert Lucian	SLR; VBW
Houston, Horace K.	SLR
Hubbell, Edward S.	SLR
Houser, Paul Willard	SLR; VBW
Heck, George L., Jr.	SLR
Hieber, Milo W.	FRF
Haldeman, James Flack	SLR; WAC
Hope, Wellborn	KST
Heafer, Harold W.	DIK
Heath, John A., Jr.	WAC
Hughes, Charles F.	RTR
Homsher, LeRoy R.	RTR
Hallock, Roy E.	SAG
Harris, Fred R.	RTR
Houston, Philip K.	AGC
Hancock, John M.	FRF
Hilliard, Landon	SAG
Horrell, Camden Riley	FRF
Houser, Paul F.	FRF
Heaslet, James Goodrich	MJR
Hunter, Lowell W.	RTR
Hoare, John L.	SMM
Halley, Harold A.	SMM
Honsinger, Frank T.	FRF
Hammond, Reginald G.	EOT
Hollopeter, Orville C.	EOT
Hyter, Ernest H.	RTR
Harris, Theodore	SLR; CWT
Hollingsworth, John Y.	SLR
Henderson, Roma John	SLR
Hartford, Claud E.	DIK
Hinman, Donald M.	DIK
Henn, Lawrence C.	DIK
Hunt, Spencer S.	DIK
Hickman, Horace M.	RSD
Herring, Lloyd H., Jr.	SLR
Higgins, Charles C.	SLR
Hunt, John L.	SLR
Haff, Warren C.	DIK
Haines, Harold H.	DIK
Heanue, Francis W.	DIK
Hicknott, De Carmo	DIK
Hasbrouck, Louis	KST
Holden, Harlan W.	FRF
Hancock, John M.	DIK
Hogan, Chester P.	DIK
Higgins, James W., Jr.	DIK
Houser, Paul F.	DIK
Hines, LeRoy M.	DIK

I

Irwin, Harry A.	SLR; WAC
Ingram, Earlo Benjamin	SLR

J

Jevon, Victor Arthur	SLR; WAC
Jones, Charles L.	SLR; WAC
Joseph, Jesse S.	SLR; EOT
Jackson, Oliver P.	SLR; KST
Jones, James S.	SLR
Johnson, Frank A., Jr.	DIK
Johnston, Granville Clinton	SLR; EOT
Jones, Wilbur Boardman	SLR; VBW
Jiskra, Joseph B.	CSO
Jones, Ulysses G.	SMM
Johnson, Elmo G.	EOT
Jacques, Gordon F.	FRF
Jones, Lloyd Bidwell	FRF
Johnson, James Alfred	SLR
Jensen, Constan	SLR; KST
Jansson, Edward A., Jr.	DIK
Jones, James W.	FRF
Jeffries, Simeon J., Jr.	FRF
Jewett, Edmund H., Jr.	DIK
Just, George A., Jr.	DIK
Jones, Stanley B.	DIK

K

Knoche, Frederick E.	SLR
Kilburn, George W.	SLR
Kane, Hoyt Roland	SLR; WAC

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A French Aviation Camp on the Asiago Plateau in Italy (French Official Photo)

Kiley, James E.	FRF; DIK
Kirby, French	FRF
Kipp, Joseph Henry	SLR; WAC
Kennedy, John W.	SLR; SAG
Kenney, Irven W.	**SLR; WAC**
Kirker, Edwin Charles	SLR; WAC
Kilroy, Edward A.	SLR; WAC
Keay, Louis Kent	SLR; CJW
Kindig, Theodore P.	DIK
Knowles, John A.	EOT
Kotzebue, Mainhard	DIK
Kresge, Ellwood F.	SLR; RWT
Kimball, Johnathan Gooder, Jr.	SLR; KST
Kenworthy, Chester L.	KST
Kiley, James E.	DIK
Kinnear, Thoburn W.	FRF
Kieran, Thomas, Jr.	FRF
Klinger, Kenneth P.	FRF
Krigger, Augustus H.	DIK
Keefer, Chauncey T.	ASM
King, Allan H.	SLR
Kauch, Robert	KST
Kent, Ezra H.	KST
Kirkpatrick, Ross C.	DIK

L

Link, Milton Peter	SLR; SAG
Luder, Leslie Jacob	EOT
Lockhart, William L.	FRF
Littel, William Bernard	SLR; EOT
Lane, Theodore T.	SLR
Lincoln, Oren E.	SLR; WAC
Leslie, John Woodworth	SLR; WAC
Leyden, Edward A.	SLR
Luce, Edgar Augustine	SLR; WAC
Lockwood, Herbert Humphrey	SLR; WFO
La Belle, Claude A.	Note 3
Lumdsden, Hugh M.	SMM
Lee, Zanna P.	EOT
Lewis, Oscar B.	FRF
Leary, Whitney	ASM
Long, Leonard F.	DIK
Lindsey, Gordon J.	DIK
Leilich, Frank T.	RTR
Lookabaugh, Leonard L.	FRF
Lucas, Oscar M.	AFO
Lowe, Larone	**AFO**
Logan, Henry J.	FRF
Lane, Orlando H.	SLR; CAF
Lawton, Malcolm S.	SLR; CAF
Lockwood, Lyman B.	SLR; KST
Lee, George Don	SLR; KST
Lockridge, George Nelson	SLR; KST
Lowry, William J.	DIK
Lowry, Henry D.	DIK
Logan, Leland	FRF
Lockhart, Frank	KST
Lundell, Floyd A.	DIK
Logan, John A.	FRF
Lachmund, Otto G.	DIK
Lind, John E.	DIK
Lord, Orlando M.	DIK
Lott, Arthur LeRoy	SLR
Lewis, Richard P.	PFO
Long, Carl C.	PFO

M

Miller, Dewey Harold	SLR; WAC
McCalmont, Albertus W.	SLR; TFT
McNeil, Irvyn H.	SLR; WAC
Miller, Charles Francis H.	SLR; WAC
Minor, Richard P.	SLR; WAC
Mitchell, Leonard C.	SLR; WAC
Mitchell, John Purroy	FRF
MacLure, Henry G.	FRF
McCormick, Vaughn R.	FRF
McKinless, Raymond	FRF
Moose, William L., Jr.	FRF
McReynolds, Finis Ewing	SLR; VBW
McCrossen, James F.	SLR
McLaughlin, John J.	SLR
McGriffin, Francis R.	SLR; CWT
Mapes, Donald D.	SLR
Matter, Milton	SLR; EOT
Mengel, Herman	SLR; EOT
Messinger, Albert	SLR
Miller, Ivan C.	SLR
Morrow, Wade H.	SLR
McLean, John J.	KST
Mack, Francis Test	SLR; MSC
Montgomery, Donald H.	FRF
Malloway, Jesse S.	FRF
Mallette, Lester D.	SLR; WAC
Maynz, Theodore	FRF
Mead, Lynn De Coursey	SLR; ADT
McCall, Carlton C.	DIK
McHenry, Arthur J.	DIK
McPeak, Norman B.	DIK
Morrison, James C.	DIK
McKinney, Edward C.	Note 6; WCS
Morris, Edward M.	FRF
Mitchell, Charles L.	PFO
Macklin, Harold D.	FRF
Mostowski, Boleslaus Francis	REL
McWilliams, John	PUP
Meany, John W.	SMM
McDuffee, Jasper K.	FRF
McChord, William C.	FRF
McCormack, Thomas H.	DIK
Meyler, George Andrew	SLR; CAF
McAleenan, Henry A.	SLR; HHN
McKinnon, John A.	FRF
McCartney, Charles E.	DIK
McCabe, Ross	DIK
McClelland, Harold C.	RSD
Mooney, Herbert R.	FRF
Moore, Robert G.	DIK
Montague, Harley H.	DIK
Mapes, Gordon W.	DIK
McFarland, William P.	FRF
McKey, Claude D.	FRF
Minster, Henry T.	FRF
Madden, John J. Jr.	DIK
McEnerny, Daniel T.	DIK
Mesnier, Edward S.	DIK
Micelli, Paul	DIK
Moore, Walter F.	DIK
Maxwell, William C.	FRF
Maurice, Benjamin V. D.	SLR
Miller, Leland W.	FRF
Mook, Samuel R.	DIK
McKinless, Raymond	DIK
McDuffie, Jasper K.	DIK
Macklin, Harold D.	DIK
Miller, Charley	TMA
McCoy, John F.	PFO
Munson, Clinton G.	PFO
Mauman, Arthur P.	DIK
Metcalfe, John W.	DIK
Merritt, Edward K.	DIK
Mechling, Eugene B.	DIK
Maxson, Harold F.	DIK
Martin, Roland H.	DIK
Macomber, Henry W.	DIK

N

Nordin, Oscar	FRF; DIK
Norris, Howard D.	SMM
Northland, Merle A.	DIK
Norton, Howard B.	FRF

(*Continued on page* 512)

Four Nieuports and a Spad being groomed for work in Flanders

FOREIGN NEWS

BELGIUM

The Belgian official statement for May 9th reports the following aerial activity:

"Enemy aviators bombed several of our cantonments without success. Our aviators were very active."

FRANCE

The French official announcement for May 7th says:

"On May 6th four German aeroplanes were brought down in the course of an aerial fight. Ten others were sent down damaged within their own lines. During the same day our bombarding machines dropped 4,000 kilograms of projectiles on the stations of Fluille, Martel, Merresis, Ham, Guiscard, Noyon, and Vermond."

The text of the French War Office communiqué for May 8th reports the following aerial operations:

"Yesterday we brought down in air fighting four German machines. Ten others fell out of control within the German lines.

"We dropped four and one-half tons of bombs on the Flaville, Martil, Messines, Ham, Guiscard and Noyon stations."

The French War Office announced on May 10th that Sub-Lieutenant Rene Fonck brought down six German aeroplanes on May 9th—a performance that has never been equaled. Before leaving the aerodrome for his first flight, Fonck declared that he would avenge the death of his friend, Lieutenant Chaput, who was downed on May 7th, credited with twenty victories. The official statement follows:

"Yesterday Lieutenant Fonck brought down six German biplanes in the course of two patrols. He downed the first two in ten seconds, the third five minutes later, and the other three in the course of the second patrol."

The French official announcement issued on May 12th, reports the following aerial activity:

"On May 10, despite the bad weather, our pursuit aeroplanes displayed activity. Two German machines were brought down and eight were seriously damaged. On May 11 a German captive balloon was set afire by our pilots.

"On May 10 and 11 our bombing machines dropped 7,000 kilos of projectiles on railway stations, depots and cantonments of the enemy, notably in the regions of Noyon, Chauny and Flavy-le-Lartel. At this last mentioned place several fires were observed."

Sub-Lieutenant Nungesser, the leading French aviator, brought down on May 7th his thirty-third and thirty-fourth German machines and damaged another, which will be undoubtedly placed to his credit. On May 5th he achieved two victories. Nungesser, during three years of air fighting, has been wounded seventeen times, and has served on fifty-two bombing expeditions.

Lieutenant Chaput, with sixteen Germans to his credit, Sub-Lieutenant Demeuldre, with thirteen victories, and Captain Mieffre, with a remarkable record, have been lost within the last few weeks in aerial combat.

A Paris newspaper states that the month of April confirmed the Allies' supremacy in the air. The French brought down 120 machines. Fourteen machines were brought down by Americans.

GERMANY

Reporting on the operations of "the last few days," the German official statement of May 9th says:

"The enemy has lost thirty-seven aeroplanes in the last few days in aerial fighting and by fire from our anti-aircraft guns."

"On Thursday afternoon and evening strong enemy air squadrons carried out bombing attacks against the Mole at Zeebrugge without causing damage of military importance," the German War Office announced on May 10th. "As a result of the bombs a Zeebrugge church was damaged and three Belgians were killed and four wounded. Three hostile aeroplanes were shot down."

The Berlin official war office announcement for May 12th reports that "In aerial fighting during the last two days, nineteen enemy aeroplanes were shot down, twelve of them being brought down by the fighting echelon formerly led by Baron von Richthofen."

GREAT BRITAIN

A British War Office announcement on May 4th, describing operations against the Turks on the Palestine front, reports the following aerial activity:

"Our air service attacked troops and rolling stock on the Hedjaz Railway, in the vicinity of Allan, and on the Wadi Sir, south of Es-Salt, with bombs and machine-gun fire. Two of our machines failed to return."

The British official statement on aerial operations issued by the War Office on May 6th states:

"There was a dense mist Saturday until evening, when reconnaissance was possible. Nine tons of bombs were dropped on the Caulnes railway junction and on Bapaume, Armentieres, Merville, and Estares.

"There was very little air fighting. One hostile machine was brought down by our aviators and four others were disabled. Two of our machines are missing. Two of our machines, missing since May 3, have since returned.

"After dark, although conditions were still unfavorable, more than three tons of bombs were dropped on the Chaulnes railway junction and on Bapaume. All our machines returned."

Successful aerial combats are described in the official statement of May 8th as follows:

"Flying again was impossible Tuesday (May 7th) until after 5 o'clock, because of a pouring rain. The weather then cleared suddenly, and machines were sent out. Four hundred bombs were dropped on different targets all along the front. Twelve hostile machines were brought down in air fighting, eight of which were accounted for in a big encounter in the neighborhood of Doual. A German observation balloon was brought down in flames. None of our machines are missing."

The British official statement for May 9th reports intense and extensive bombing activity on the part of the air service. The text of the statement follows:

"Ten tons of bombs were dropped on Le Cateau, Cambrai, Bapaume and on the docks and mole at Zeebrugge.

"In the northern area there was strenuous fighting throughout the day. Twenty-two hostile machines were shot down, seven others were brought down out of control, and another German machine was shot down by our machine-gun fire. Seven of our own aeroplanes are missing.

"Owing to the mist only a few other aeroplanes were able to fly after dark. A ton of bombs was dropped on the railway stations of Douai and Marcoing. All machines returned."

The official announcement on aerial operations issued on May 10th reports numerous aerial victories on the part of British aviators and successful bombing raids as follows:

"The cloudless weather on Thursday enabled our aeroplanes to carry out a full day's work. More than twenty-four tons of bombs were dropped on different targets, including important railway stations at Tournay, Marcoing, Chaulnes, and Cambrai, and billets at Carvin, Péronne, and Chipilly, and the docks at Zeebrugge.

"Fighting in the air was more or less continuous, and it was particularly fierce toward dusk. Twenty-seven German machines were downed, twelve were driven down out of control, and four hostile observation balloons were destroyed. Six of our machines are missing.

"During the night four and one-half tons of bombs were dropped on the docks and at the entrance of the canal at Ostend and three and one-half tons on Péronne, Chaulnes, and Bapaume. All of the machines returned."

Fine weather stimulated aerial activity, according to the announcement of May 11th, which reads:

"Low clouds and mist prevented flying on Friday until 5 P. M. After this hour the weather cleared on a small part of the front and great aerial activity took place in this sector until dark.

"Over fourteen tons of bombs were dropped on Péronne, Bapaume, Thielt, Douai, Zeebrugge, and the docks of Bruges.

"Hostile scouts were very active and made repeated attacks on our bombing machines. Eight German aeroplanes were brought down in air fighting and six were driven down out of control. Nine of our machines are missing. One reported missing on Tuesday has returned."

The British official announcement issued on May 12th reports the following aerial activity:

"On Saturday, except for a short period of clearness in one sector, enabling reconnoissance and bombing, the whole front was enveloped in mist throughout the day. One hostile machine was brought down in the air fighting. Two of ours are missing. Three other German machines were brought down Friday, in addition to the eight previously reported."

In a recent issue of London "Flight" we learn that it is reported that between March 21st and April 3rd, British airmen fired 1,139,525 rounds of small arm ammunition from their machine-guns into German troops and transport columns. That estimate, however, is very well inside the mark, since official figures record that in two days over 700,000 rounds were expended by low-flying machines. Regarding bombing, the R. A. F., during the latter phases of the present battle, dropped 303¼ tons of bombs on German billets, railheads, dumps, gun positions and concentrations of troops. Day bombing accounted for 179¼ tons of bombs, while 151 tons were dropped by night bombing squadrons. The greatest weight of bombs dropped in any one day was 28¾ tons, while the greatest in any one night totaled 31 tons.

ITALY

"In an air fight Saturday (May 4th), in the Gulf of Trieste, three Austrian seaplanes were brought down," said the official statement of May 7th from Rome. "All of our machines returned safely."

Italian aviators, according to reports, have destroyed the hydro-electric plant in the Trentino, which supplies the power for the Austrian railways leading to the front.

An official statement from London on May 9th reports very successful aerial operations on the part of the British airmen on the Italian front, as follows:

"Two successful raids were carried out and we captured a few prisoners. The artillery is more active. Hostile batteries were engaged with satisfactory results. Our air forces, since the last report, have destroyed seventeen enemy aeroplanes. None of ours was lost."

A report from Rome on May 9th says that British aviators bombed the aviation ground at Motta di Livenza.

Intense aerial activity all along the Italian front resulted in the destruction of five enemy machines, the Italian War Office announced on May 10th.

"During the last few weeks the Italian hydroaeroplanes have been very active, accomplishing daring raids," says an official dispatch from Italy received on May 10th. "On Wednesday last (May 8th) three hydroaeroplanes flew over Trieste at a low altitude for observation purposes, while four Wisinest hydroplanes belonging to the enemy gave chase. After completing their mission our machines pretended to desire to escape, and drew the enemy planes toward the Italian coast, where five of our own chasers immediately engaged them.

After a short engagement, one of the enemy hydroaeroplanes was hit and fell into the sea. All of our machines returned safely to their base."

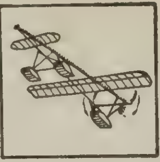
The Italian War Office announcement of May 11th says:

"There was intense aircraft activity. One of our airships dropped a ton of bombs on the Mattarello railway station. Three hostile aeroplanes were brought down and one Drachen was set afire by British airmen."

On May 12th, the War Office announced that seven hostile aeroplanes were brought down.

MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

By John F. McMahon

WERE you to throw a pie plate from you with sufficient force, it would make a graceful glide, and the glide would be in proportion to the energy expended in throwing this plate.

An aeroplane works on much the same principle, the force acting on the aeroplane to keep it moving is called the "Thrust," and is made by the engine turning the propeller, and screwing its way into the surrounding atmosphere. From this it can be seen that an aeroplane must move forward in order to remain aloft and the speed that it must move forward is gauged by the weight of the machine, size of wings, etc.

In figure 1 we see how the forces just mentioned act on an aeroplane wing, arrow *A* shows direction and angle of plane, *B* shows wind acting on the under surface of the wing, *C* shows how arrow *B* is cause of *C* or lift that machine gets from the forward motion. But as this is more technical than we care about going into at this stage of our course, we will leave it for the present and proceed with the simpler part of our work.

Another item we must remember is control. Without this the aeroplane would float around like a leaf in the wind. To control a machine it is necessary to have a tail for horizontal control, wing tips or "ailerons" for lateral balance, and a rudder for steering left or right. Another system for balancing a machine is to warp or to twist the wings. This last system is not as much in use as the former because the wing must be made flexible, and of course cannot be braced as well as the "aileron" system. In the models we are to build for the present it is not practicable to fit the wings with "ailerons," but it is well at all times to keep them in mind as a great many faults in a model can be corrected by knowing that a slight twist of the wing might correct the fault.

A model can be balanced for flight without the use of "ailerons" by locating the center of gravity properly causing the model to be almost inherently stable, to learn more about this part of our course we will build a small glider. This glider can be made inexpensively from wood by the following instructions and referring to the accompanying drawings.

The main plane is made of soft white wood 20 inches long and 3 inches wide and planed to the section shown at figure 4, after which it may be sandpapered and varnished to a smooth finish. The tail is next made in the same way, the size of this being 7 inches by 3 inches. The section is the same as the cross section of the wing as in figure 4. The body is also made of soft white wood to the form and size shown at figure 6. For efficiency it is better to round the corners, and if possible to the form of a bird's body as shown in cross section, figure 7.

The reason for leaving the top flat is because we will have to have a surface to attach the plane, and tail, too. For directional control we will use a piece of thin aluminum or tin, cut to shape and size in figure 5.

Our next step is to drill out a hole in the nose of the body ½" in diameter as shown in figure 8 and fill it with lead. This is done to bring the balancing point as far forward as possible. About an ounce of lead will be sufficient.

To assemble refer to figures 8 and 9, and proceed as follows:

Attach the rudder in place by cutting a slot in the tail of the body, insert tongue of rudder, wrap with thread and glue, next put tail in position with small nails and glue, next put main plane in place, fastening with rubber bands only. There are two reasons for using the rubber bands, first to allow free movement in plane for easy adjustment and secondly, should glider come down sharply on its nose, the wing would move forward freely, and not break off, which would happen if it was fastened rigidly.

To adjust the model for flight proceed as follows: Grasp the model lightly between the fingers and locate point where model balances evenly, mark this point with pencil on paint.

Next place leading or entering edge of plane even with this point, and insert a small block of wood between the plane and the body. This is done in order to give the plane an angle of incidence which is described in figure 1.

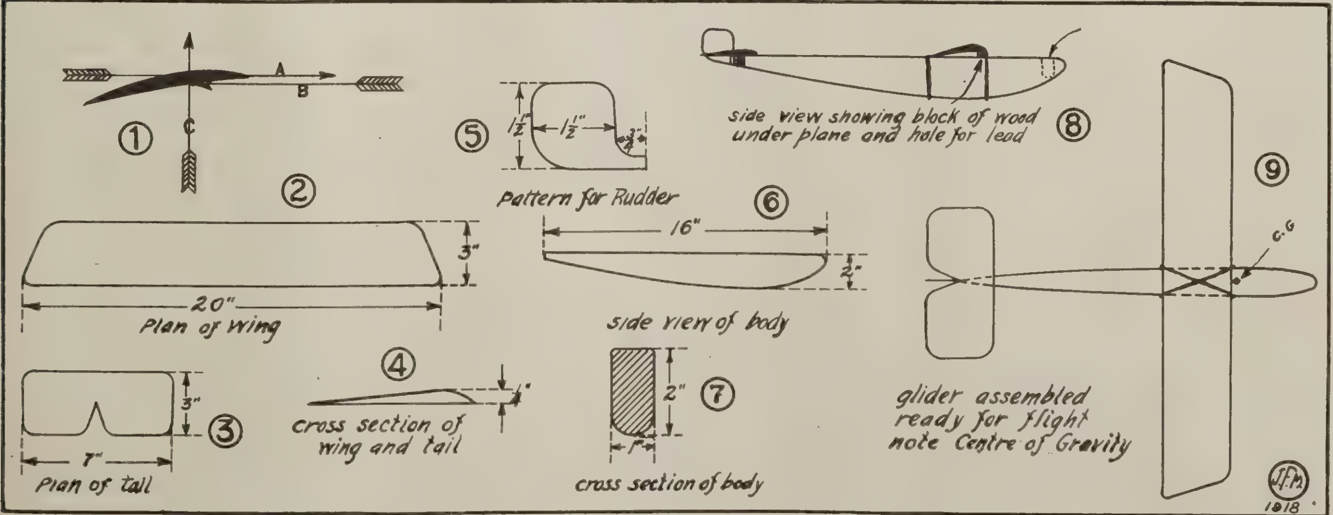
To fly, select some high ground, or the side of a hill, hold the body of the model firmly in the hand, face into the wind, and throw the glider from you on a line with the shoulders. Never launch a model upward, it would be better to aim it at an imaginary point on the ground about 100 feet away. The reason for this is, if not balanced properly it will make a sharp accent, lose momentum, and promptly slide tail first to the ground. Should it do this, slide the plane back toward the tail about ½ inch and repeat the performance. If it should dive sharply to the earth, slide the plane a little forward, and so on, until model makes perfect flights.

If constructed and balanced properly flights of from 30 seconds to 1 minute can be accomplished. We are now past the first step of aeronautics.

(To be continued)

Ralph E. Olson in Aviation Service

Ralph E. Olson, who will be remembered as an old model flyer, is with the Aviation Signal Corps at Kelly Field, Texas. He is doing some experimenting with models during his spare time, and we expect to publish some of his work in an early issue of this paper. He wishes to be remembered by his old model friends.


①
A
B
C
②
3"
20"
Plan of wing
③
3"
7"
Plan of tail
④
¼"
cross section of wing and tail
⑤
1½"
1½"
¾"
Pattern for Rudder
⑥
16"
2"
side view of body
⑦
2"
1"
cross section of body
⑧
side view showing block of wood under plane and hole for lead
⑨
C.G
glider assembled ready for flight note Centre of Gravity
J.F.M.
1918

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

How to Behave on the Flying Field

Never go on to the flying field with the *common mob. Wait* until the section has marched out and then *Drift Leisurely* out, an hour or so *late.* This will show Lt. Wells that flying means *nothing* in your young life and will *strongly* ingratiate *you* in *his* favor.

* * *

On the way *out* cross the landing field, forcing a couple of planes to turn out of your way, if *possible.* Your *courage* and *daring* will be greatly admired by *everyone.*

* * *

As *soon* as you reach the *Field lay* your helmet and extra garments on the *Gasoline car. Sit* down somewhere on the car if there are any vacant seats. The *driver* will be *greatly* pleased at this trifling courtesy. If all *seats* are taken, promenade up and down *in front of* the fence, *walking* over the *wind indicator* as many times as convenient. If no seats are vacated, *arrange* yourself on the *ground* and try to *sleep.* Everyone will then know that you are an *old* flier and that you do not *care* to watch the *landings* and the *take offs.*

* * *

Never appear *interested* in the aeroplanes or their actions. This is only done by *newcomers* who are *waiting* for their first *joy ride.*

* * *

After you have *been* on the field *ten* or *fifteen* minutes, quietly approach *Lt. Wells* and *ask* to be excused to go to the Y. M. C. A. to get a cup of *chocolate.* This permission will be *happily* granted.

* * *

When you get to the Y. M. C. A., do not return until the next *morning.*

* * *

If you do not get there the first time keep on *trying.* This will show the lieutenant that *you* do not go after a thing *half-heartedly.* From *then* on he will be *especially* interested in your case.

* * *

Always take a book along with *you* to read. Your literary *turn* of mind will thus be *indicated* and you will *probably* be rewarded with an extra *ride*—possibly by the Lieutenant *himself.*

* * *

If an accident occurs, *rush* out to the machine and *cluster* around. Do not *hesitate* to take pieces of the wreckage for mementos. Get the *Altimeter* or the *Carburetor* or something that can be easily *packed* for *transportation.*

* * *

When the class is dismissed *scramble* for the barracks. Do not *wait* for formations or *roll-call* or *anything* like that. Make it *snappy. Try* to be the *first* one to reach the barracks. Lt. Wells will be *agreeably* surprised at this show of *speed.*

* * *

—From "The Wing Slip," published weekly at one of the American Aviation Camps in France.

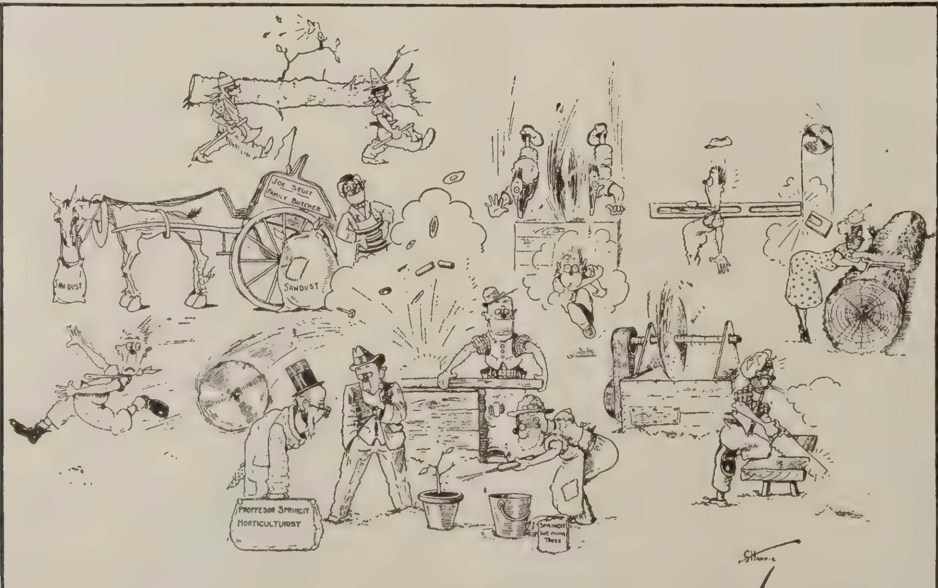
A Proper Answer

A young lady recently sent this extraordinary request to the editor:

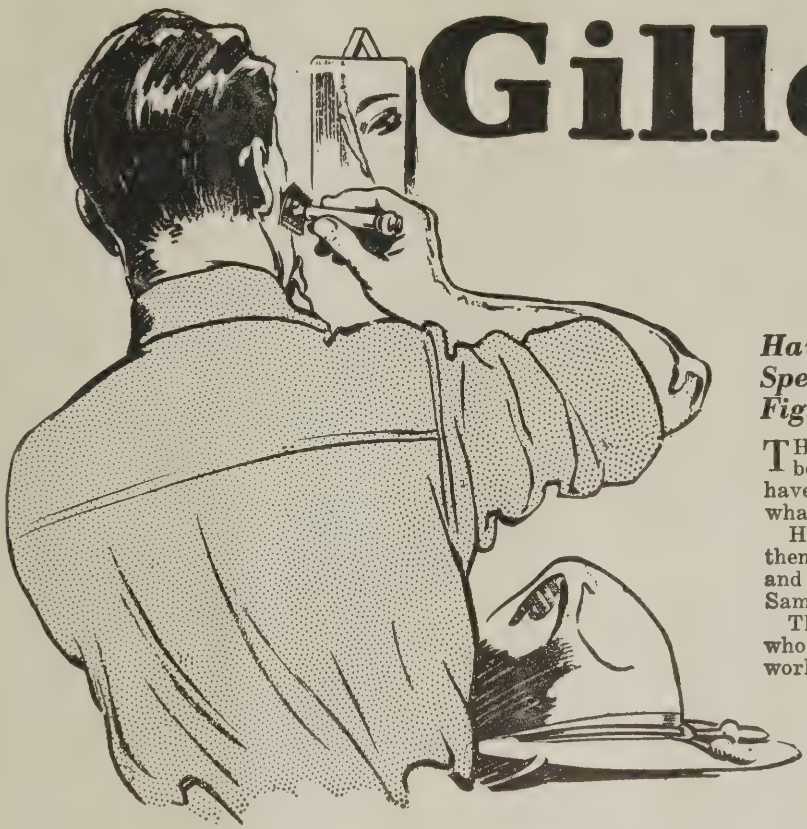
"Do you think it right for a girl to sit in a man's lap, even if she is engaged?"

The editor spent some time in thought, and then answered her as follows:

"Yes, if it were our girl and our lap. Yes, again, if it were some other fellow's girl and our lap. But if it were our girl and some other fellow's lap, emphatically no. We don't approve of such frivolity."



Scenes in an aircraft factory. The Saw Mill. This exclusive photo from "The Aeroplane" shows all of the processes in aeroplane woodworking construction, from the conference between the works manager on accelerating the growth of trees to the last finishing process



Gillette
Safety Razor

Have You Seen the New Gillettes Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

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Soon or late, every man who is doing things comes to the Gillette. They belong together. Ten million up and doing men all over the world had discovered the Gillette before the war broke out. The war simply made the Gillette prove itself under extreme conditions—as no other razor has or can.

It has thrown the spotlight on the Gillette Blades—on the Gillette principle of No Stropping—No Honing—on the Gillette idea of a simple, compact shaving outfit, no strops or hones to clutter up the kit—on the Gillette contention that a man's daily shave should be an incident and not a ceremony.

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(*Continued from page* 490)

sion about the formation of a company to manufacture military aeroplanes for the Government. With Mr. Borglum at the time of the encounter on the train was Hugo C. Gibson, an engineer, associated with the British Munitions Ministry at its New York office, 120 Broadway.

In a statement by Mr. Mix, which forms the principal documentary exhibit, Mr. Mix says that "these two men intimated to me that they could produce designs for a plane that would be faster than the Albatross." The Dodge Company had the latest Albatross designs and was intending to build a machine of that type.

Mr. Mix became interested, he saw Mr. Gibson in New York, and says that Mr. Gibson told him that Mr. Borglum had confidential relations with the Government which would be to the advantage of the Dodge concern as well as to themselves. That was in December. On January 2 President Wilson gave to Mr. Borglum a letter authorizing him to make inquiries in official quarters to ascertain the truth of allegations Mr. Borglum had made in connection with the military aircraft production program. Soon afterward Mr. Mix met Mr. Borglum in Washington and saw the letter from the President to Mr. Borglum.

According to Mr. Mix, Mr. Borglum told him that he did not know how to build planes that would surpass those now being constructed, "but that through his friendship with the White House and acquaintance with Mr. Gibson, the engineer in the employ of the British Ministry of Munitions, he would have access to the best foreign designs practices."

Mix Informs Officials

Mr. Mix, according to his statement, became suspicious, and conferred with Mr. Hardesty, a consulting engineer of Washington and a friend of Mr. Mix's father. Mr. Hardesty knew Howad Coffin, the Chairman of the Aircraft Board, and the matter was laid before him, General Squier, Chief Signal Officer of the Army, Colonel Deeds, and Colonel Montgomery of the Military Aircraft Administration. Subsequently it was decided to lay the matter before Vice President Marshall, a friend of Mr. Mix. This was done on Jan. 20, and on the following day the Vice President informed Mr. Mix that he had brought the case to the attention of Secretary Baker.

In his statement Mr. Mix says that after discussion of the matter at the Metropolitan Club in Washington with Mr. Borglum and others he informed Henry Harrison Suplee, consulting engineer of the Dodge Manufacturing Company, that he thought it best to drop all discussion of the proposed company, as Mr. Borglum did not have any designs for a new aeroplane to submit, "but was probably relying upon his official powers to requisition and get certain information from the Government which could be turned over to the new company for construction." Mr. Borglum stipulated, according to Mr. Mix, that he—Mr. Borglum—was not to appear in the new company but that he would be represented in it by Benjamin Harris, President of the Standard Smelting and Refining Company of New York.

Senator Thomas made only the briefest comment in presenting the documents to the Senate. "This shows Mr. Borglum's criticism of the aircraft program to be entirely without merit," he said.

Denial by Borglum

A formal statement given out by Mr. Borglum follows:

"Let us dispose of the two questions separately, raised by Deeds's former agent, Mix, and Mix's engineer. Their first and foremost charge is that I used the President's authority improperly and in a manner unthinkable between men in mutual confidence. I deny this. It is a 'frame-up,' shaped especially to offend, as it properly should, the President. My regret is that it seems to have been successful, and he published, unfairly to me and without warning, some of his letters to me. About this time I received further information from a confidant of the President that the Administration now possessed a club that would put me out of business if I did not quit.

"Their second charge is that I was party to or in some way or another was secretly engaged in aeroplane production, using my position and confidence of the President to this advantage. I deny that falsehood in every detail, as unfounded, without reason or support. I wish also to add, regarding Mix, that he came to my attention through his own charges against the Aircraft Board, and submitted a lengthy typed statement, charging the aircraft department with culpable retardation and delays prejudicial to the interests of the country. The original of this statement was returned to Mr. Mix at his earnest pleadings, after he had confessed that he had been in touch with a uniformed member of the board, and, by his own statement, had been heavily commissioned by that member. Mix is a witness for specific charges of 'crookedness' he himself charges against Colonel Deeds and Deed's 'partners,' and will, if the Government does not persist in whitewashing this entire business, be compelled to appear as a party with Deeds in matters Mix himself designated as 'crooked.'

"Regarding Mr. Baker's statement of pro-German influence: This unfortunate statement from an officer of the Government whose office has resisted successfully every effort to investigate and get at the truth upon any subject relating to the war, and whose department is so amply supplied with advisers, close in the confidence of the Secretary, of Teutonic origin, is ludicrous. I do not here impugn the patriotism of any of these men. I do say, candidly and emphatically, that it is unfair to ask German blood, though born in America, to be as prompt as war demands in the execution of their orders against their Fatherland. Never has a department of a government of a great nation submitted an agent of its executive to such contemptible, unjustified sloughing and general interference as was prosecuted against me in my work, and I challenge Mr. Baker or any department of the Government to investigate or to explain and justify in any way their conduct in this.

"Frame-Up Deliberately Planned"

"Every American knows now that the War Department has systematically directed the opposition to investigate; that every subterfuge has been resorted to to gain time. Every investigation—and there have been many—has been instituted with a prayer and hope that a clean bill would be secured, and it is now clear that this final 'frame-up' was deliberately planned and laid in preparation to destroy the value and validity of my investigation.

"It should not be forgotten that I have been accused indirectly of the death of Blakeley, a fine, sober youth, who lost his life at Mineola on the 17th of January through the failure of the Liberty motor; also, that I have been accused of stealing a trunkful of blueprints of a famous Italian aeroplane, and that these, with the present charges and possibly others, have been in the hands of the Military Intelligence Department, Secretary Baker, Mr. Coffin, and now, I learn, of Vice President of the United States Marshall, together with the President of the United States, and that no use was made of them, and that I have never been given an opportunity to explain or know of them officially until it became apparent last week that I would stand by the subject until it was investigated.

"I am sorry, more than I can say, that we should suddenly be thrown into a difference over a proper affair, an honest investigation that honest men never object to, and I cannot but think that the Secretary of War's blow at me is other than a colossal blunder. Personally, I am not of the remotest importance in this matter. The nation demands to know why a billion dollars in eleven months has provided us with no planes. Next, it demands to know who is responsible. There has a graver question arisen: Who is it that is so powerful, and where are they, that makes it impossible and dangerous to the character and honor of men that they shall ask this question?

"GUTZON BORGLUM."

May 11

The Bristol Scout Discussion

The Senate Military Affairs Committee learned of new disappointments in the aircraft program. After their weekly conference with the War Council, members of the committee said serious difficulties were being encountered in the manufacture of the Bristol fighting plane. The aeroplane has not been accepted and one member of the committee declared his belief that it never would be accepted by the War Department.

The main obstacle to the production of the Bristol machine has been engine trouble. It has been impossible to date to fit it with an engine which would function satisfactorily, according to members of the committee. When the Liberty motor was tried the radiation was inadequate and efforts to change the machine to get around this difficulty have proven unsatisfactory, it was stated.

The Bristol aeroplane was one of the types of fighting machine on which much reliance was placed. The Military Affairs Committee's discovery of the situation added to the impatience in Congress over the delays in the aircraft program and stimulated the determination to go to the bottom of the reasons for the alleged failure of aircraft production.

My Brave Birdman

By EDA ELIZABETH LYONS

Far swifter than the eagle bold
Through misty heights you fly,
Your realm it is in cloudland fair,
Your kingdom, 'tis the sky.

Do you ever lose the stirring thrill
When through vast space you soar,
When you leave the big world far below
With its tumult and its roar?

Do you ever feel as if your soul
Were scaling with you too?
Do you ever think of those on earth
Who watch and pray for you?

Or does the call, so loud and clear
Of duty, fill your ears,
The thought of God and right and truth
Drive far from you all fears?

I know it must; I know it does,
For with brave heart you risk your all,
The unknown holds for you no dread,
Death holds for you no pall.

So go, my lad, my brave birdman,
To combat far above,
And know that come what will or may,
It cannot kill our love.

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Aviation Engines, by Page. Price $3.25 postpaid.

Practical Wireless Telegraphy, Bucher. Price $1.60 postpaid.

Military Map Sketching and Reading, by Barnes. Price $.85 postpaid.

Glossary of Aviation Terms in French and English. Price $1.10 postpaid.

The Eyes of the Army and Navy, Munday. Price $2.15 postpaid.

Gas Engine Principles, by Whitman. Price $1.70 postpaid.

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Nestor, Charles Wallace	SLR
Nevin, John, Jr	FRF
Nott, Sherrard G.	DIK

O

Ogden, John W.	FRF
O'Brien, Robert E.	UIU
O'Neil, Paul F.	SMM
Olin, Alfred L.	DIK
Orlady, Horace P.	BST
Orr, Harold E.	DIK
O'Neil, Charles	PFO
Orsinger, Remington	FRF
Otis, Thomas F.	DIK

P

Penick, John Newton	SLR; KST (2)
Pendleton, Albert G.	SLR
Phipps, Lawrence C., Jr.	SLR; CJW
Pierson, Walter E.	SLR
Poulin, John A.	SLR
Pyke, Charles L.	SLR; RSD
Purdy, Donald F.	SLR; WFO
Pinney, Edwin Robert	SLR; VBW
Pettit, Dwight M.	SLR; PWM
Pierce, Howard A.	SLR; EOT
Polhemus, Dudley A.	SLR; CSO
Parsons, Frederic C.	SLR
Pearcy, William H.	FRF
Pearson, William F.	CSO
Piggins, William S.	Note 5
Parsons, Theodore D.	FRF
Presser, Harvey W.	SMM
Pincoffs, Edmund P.	RTR
Pearson, Raymond F.	DIK
Penick, John N.	DIK
Phillips, Charles T.	SMM
Plummer, William L.	BST
Parker, Albert N.	DIK
Plummer, Summer, Jr.	SLR; KST
Pardridge, Clinton Edward	SLR; KWT
Putnam, Kingman W.	DIK
Prestridge, Robert W.	SLR
Pascale, Henry	RSD
Pendleton, Archibald F.	DIK
Parker, Herbert N.	DIK
Pawley, George P.	DIK
Pattiani, Aloie W., Jr.	DIK
Pyke, Robert W.	PFO

Q

Quade, Morey Saint Clair	SLR; EOT
Quinn. Frank Joseph	SLR; PFO

R

Reardon, Oliver A.	SLR; RWT
Rubel, James L.	SLR
Robertson, Charles W.	SLR; WAC
Rosson, Horace G.	FRF
Russell, Donald C.	FRF
Robertson, James B.	DIK
Rowland, John C.	EOT
Reisz, George S.	DIK
Richardson, Elbert Lindsey	FRF
Rodney, Archer U.	CSO
Rawley, Palmer Brice	SLR; MSC
Rawn, Ira Leete	SLR; KST
Reynard, Lester A.	DIK
Rhea, Robert	SLR; KST
Rieker, William James	SLR; KST
Rogers, John Henry	SLR; KST
Rose, Elmer J.	DIK
Reakirt, Robert H.	DIK
Rainbourn, Claude	DIK
Roehlk, John	FRF
Reese, Lewis R. P.	KST
Rivers, Harold R.	SLR
Ryan, Austin, T.	SLR
Rosson, Horace G.	DIK
Rolls, Frederick A.	DIK
Reid, Kenneth M.	DIK
Ronsinger, Frank T.	DIK
Rugh, Charles V.	DIK
Rose, Rolland L.	DIK
Rideout, George R.	DIK
Richardson, Ralph E.	DIK
Rask, Peter S.	DIK
Randell, Hugh P.	DIK

S

Stanton, Edgar	SLR; EOT
Stevens, Edward	SLR; CSO
Stuart, Byron D.	SLR; PWM
Sievering, Philip John	SLR; EOT
Sheedy, Charles A.	SAG
Sammon, William Bryan	SLR; CJW
Sanborn, Philip G.	SLR
Smith, Henry J.	SLR
Stitt, Donald G.	SLR; RSD
Stoops, Robert C.	SLR; RSD
Sage, Evan Taylor	SLR; WAC
Sales, Carter	SLR; WAC
Schiebel, Otto	SLR; WAC
Smails, William H.	SLR; WAC
Snodgrass, Clarence B.	SLR; SAG
Souther, Hollister R.	SLR; WAC
Sudlow, William B.	SLR; EOT
Seward, Charles D.	FRF
Seevers, Raymond C.	FRF
Summer, Harlin R.	FRF
Slimmon, James B.	FRF
Sears, Louis A.	FRF
Smith, Ralph Emerson	SLR; VBW
Schwab, Laurence Von Post	SLR; WAC
Sherwood, George Fountain	SLR; WAC
Swingley, Charles Edward	SLR; KST (2)
Stratton, Thomas Albert	SLR; PWM
Smith, Larue	SLR; PFO
Schlaich, Frederick William	SLR; FOB
Smith, Clarence B., Jr.	DIK
Simpson, Joseph H.	RTR
Stevens, Henry LeNoble	FRF
Stevenson, William F.	AFO
Scott, Rossiter S.	RTR
Shirey, William Hampton	FRF
Steele, Dudley M.	BST
Shull, Charles Eugene	SLR; KST
Sohm, Elbert Gustave	SLR; KST
Scott, Paul Clarence	SLR; KST
Smith, Frank B.	KST
Shupp, Burton A.	KST
Santon, Alexander H.	SLR
Shaffer, Harvey W.	SLR
Smiley, James H.	SLR
Smith, Walter S.	SLR
Stapler, Walter S.	SLR
Seward, Douglas C.	FRF
Shorney, George H.	DIK
Senter, James C.	DIK
Scanlan, Lawrence F.	DIK
Shrader, Harlan L.	SLR
Slaven, Thomas W.	SLR
Smith, Stanley	SLR
Shober, John B.	**CSO; Note 8; WCS; Note 1**
Schechter, Isaac	KST
Sparks, Robert L.	FRF
Stees, Donald B.	FRF
Shirk, Kenelm L.	KST
Smyth, Herbert C., Jr.	DIK
Smith, Edward L.	DIK
Swertfager, Florian F.	DIK
Shirk, Kenelm L.	KST
Sarthou, Alexander E.	DIK
Speidel, Frank K.	DIK
Stuart, George D.	DIK
Stewart, John H.	DIK

T

Treon, Roland G.	SLR; CWT
Thomas Errold B.	SLR
Thompson, David E.	SLR
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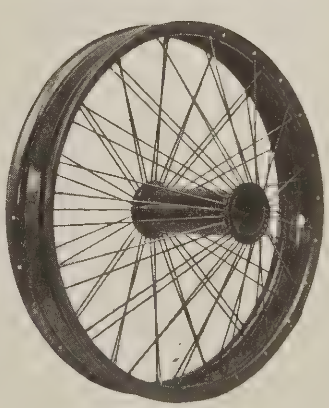

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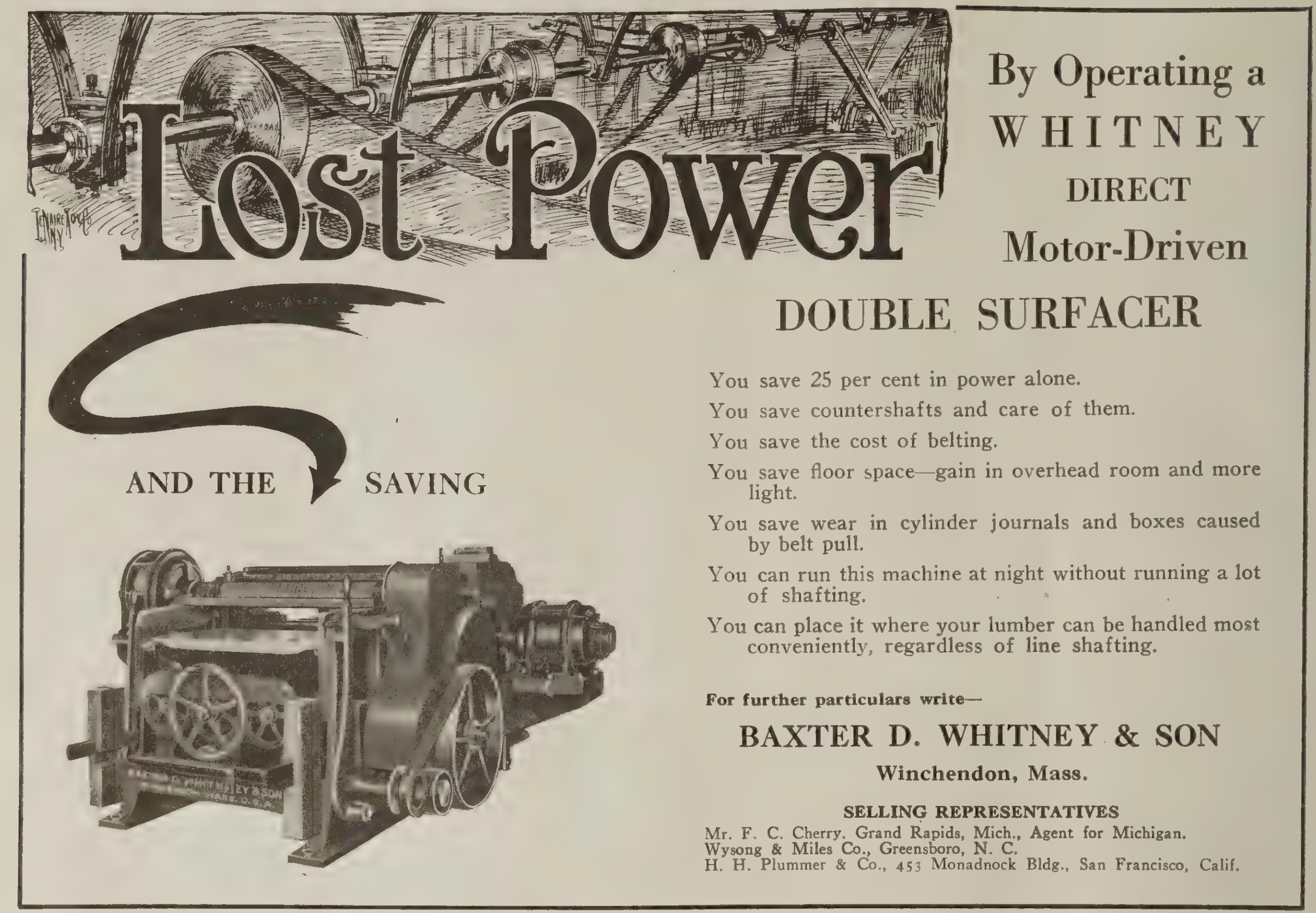

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Taylor, Harold L.	DIK
Taylor, Otto F.	Note 7; WCS
Tilford, Hoyt D.	RTR
Taylor, Herschel R.	AGC
Tawney, James, M.	SAG
Tifft, Robert H.	SMM
Turner, Louis Roy	SLR; VBW
Thompson, William	ASM
Todd, Kirk W.	BST
Taylor, James Archibald	SLR; KST
Tripp, Isaac	DIK
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Tate, George L.	SLR
Titus, Charles B.	KST
Touchstone, Jonas S.	DIK
Tiffany, Carter	FRF

U

Utley, Willard	SLR; KST
Underhill, Frank H.	FRF

V

Viele, Dorr	Note 2
Van Nostrand, Percy E.	FOB
Von Kolnitz, Alfred H.	RTR
Van Surdam, Henderson E.	FOB
Valentine, Allen W.	PFO
Van Veghten, Theodore S.	DIK
Valiant, Frank L.	KST
Vincent, John H.	FRF

W

Wright, Burrell	SLR; WAC
Warner, Sam B.	SLR; WAC
Wissler, Edison	SLR; WAC
White, Walter L.	SLR; WAC
Whitall, John	SLR
Wood, Norman B.	SLR
Wood, Palmer P., Jr.	SLR
Wallace, Glenn Edgar	SLR; KST
Wooling, Kenneth Kaarta	SLR; WAC
Williams, Harry C.	AGC
Wolfe, Gibson G.	FRF
Watter, Carl F.	SLR
Westaby, Clarence R.	SLR; CJW
Watson, Henry L.	FRF
Winslow, Kenelm, Jr.	FRF
Walsh, Edward Stanton	SLR; VBW
Warner, Donald A.	SAG
Wyeth, Marion S.	WAC
White, William E.	FRF
Whitty, Henry Raymond	SLR; CJW
Wilder, Morris B.	SAG
Wasserboehr, Francis B.	ASM
Weekley, Jefferson C.	FRF
Wuest, Jacob W. S.	FOB
Webb, Torrey H.	HHN
Webb, James E.	DIK
Washburn, George H.	EOT
White, Albert Howard	SLR; KST
Williams, Edwin Purnell	SLR; KST
Williamson, Robert Raymond	SLR; KST
Walker, Robert M.	FRF
White, William E.	DIK
Walker, Lambert R.	DIK
Woodward, Mark R.	DIK
Wales, Edward V.	SBI
Weeks, Henry J.	WAC
Walker, Burton William	SLR; KST
Walton, Loren Lee	SLR; KST
Wheeler, Irwin	SLR; KST
Weidmann, Otto Lewis	SLR; KST
Wilcox, Sydney Gay	SLR; KST
Wells, Harold R.	SLR; KST

Y

Young, Naasson Sheldon	SLR; KST

Z

Zeigler, Rannie Lloyd	SLR; DIK
Ziebur, Max C.	FRF
Zwetow, Arthur Nathaniel	SLR; ADT
Zimmer, Daniel B.	FRF

Ensign Lloyd A. Perry, United States Naval Reserve Force, died as the result of a seaplane accident in France on April 12, the Navy Department announced.

Frank L. Baylies of New Bedford, Mass., a Lafayette flier and now a member of the "Stork" Escadrille, to which the famous Capt. Guynemer belonged, made a thrilling escape from Germans who were pursuing him across No Man's Land, where he was forced to come down after an aerial combat.

Baylies's machine landed about 500 yards from the enemy's trenches. The Germans, who had been watching his descent, began peppering his machine with bullets. Baylies leaped from his plane and made all speed for the French lines. The Germans left their trenches in pursuit, keeping up a hot fire with rifles and machine guns.

Baylies, who has some record as an athlete, sprinted on. Later he said that never before had he covered the ground so fast as in the last sixty yards of that run home.

Thomas Hitchcock, of Westbury, L. I., the American aviator who was brought down behind the German lines last month, was slightly wounded and is a prisoner, according to information received by his family to-day.

The information was contained in a cablegram from the International Red Cross, at Geneva, Switzerland. It read:

"Hitchcock reported prisoner. Slightly wounded."

Lieut. Alan F. Winslow, an American aviator with the Lafayette Flying Corps, has downed his first enemy plane. Winslow was a student at the Sheffield Scientific School at Yale University and editor of the *Yale Sheffield Monthly* before his enlistment.

Lieutenant Russell E. Bracken Corey, formerly of Yale, has downed his first opponent.

Personal Pars

G. H. Brodie, of the Packard Motor Car Company of Detroit, has been transferred from the position of assistant carriage chassis engineer to the aircraft engineering staff.

A party of more than one hundred American airmen were invited to tea at Windsor Castle by King George and Queen Mary on April 29th. At the reception the King and Queen expressed appreciation of the excellent work the men are doing in the cause of civilization.

Lieutenant James A. Meissner, whose home is in Brooklyn, after a thrilling aerial battle at a height of about 15,000 feet, on May 2nd, shot down an Albatross scout, which fell in flames. This is the fourth German aeroplane destroyed over the American lines.

Lieutenant Meissner, is twenty-one years old and is a graduate of Cornell. He came to France a few months ago and qualified as a pilot.

Sergeant Frank L. Baylies, American aviator in the French air service, has downed his sixth opponent, and as a consequence is rated as an "ace." Sergt. Baylies was denied admission into the U. S. air service because of physical disqualifications.

Britain May Have Aerial Hospitals

British medical authorities are seriously considering the possibility of providing aerial hospitals for the treatment of tuberculosis in its early stages.

This information has reached the Bureau of Foreign and Domestic Commerce from the American Consulate at Dundee, Scotland. He

Thomas

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quotes from an article prepared by a physician on the feasibility of resorting to air flights to cure the disease.

The writer calls attention to the fact that the air of high altitudes is absolutely free from germs and that the atmospheric pressure gets progressively less as one ascends. He states that this germ free air is just what the physician is constantly seeking at the cost of infinite labor, expense and care, and which he rarely attains on earth.

"It is possible," he says, "that freedom from germs, lowered atmospheric pressure and the complete sun bath obtainable in the air may lead to the creation of aerial hospitals for specially selected cases of consumption. Personally, I look forward confidently to the day when aerial hospitals will be an ordinary equipment of every city."

The Lettering of German Aeroplanes

THE following notes by a well-informed neutral correspondent will explain the system by which German aeroplanes are known by type-lettering, such as the C.III., D.IV., and so on:—

A recent paragraph of vacant situations for German test pilots of A, B, C, D, E, and G aeroplanes brought in various inquiries whether the letters were chosen for individual aircraft or the initials of certain marks, like Albatros, Brandenburg, Gotha or whether they were a type identification agreed upon by the German trade.

The latter idea being the right one, an explanation dealing with the covering of these letters will be of interest.

At the outbreak of war the large group of "Taube" (Dove) monoplanes—delivered more or less to a standard by firms like Albatros, D.F.W., Etrich, Jeannin and Rumpler—was classified by A, that of the 100-h.p. tractor biplane—manufactured chiefly by Albatros, Aviatik, D.F.W. and L.V.G.—being identified by the letter B.

When the monoplanes disappeared, the "Doves" being given up for the chief early war task of patrolling, some time passed till the A class was again represented, and this by the Fokker, being terminologied A.II. against the A.I. machines starting the war.

Similarly, the B.I. biplanes passed at the later part of 1915 into the B.II. aeroplanes, the main features of which were the diminished dimensions.

The war having by now taught lessons of how to equip for fighting, bomb-dropping, wireless directing of artillery, and photography work the C class was developed along the lines of and at the same time as the B.I. aircraft, the horse-power being increased to 160 in the C.I. type, which could in turn tackle each of the before-mentioned tasks.

The model C.II. showed an increase in horse-power to 175 with a decrease in dimensions, the equipment comprising bomb-dropping facilities through two cylindric holes in the body or for four bombs hanging below it.

In the C.III. the measures were still smaller—a span of 12 yards by 36 square metres in area—and the main feature being the presence of two machine guns—a fixed one, fired through the propeller by engine gearing released by the pilot and a movable one, operated on a gun turret by the observer.

The C.IV. type is equipped with engines of increasing horse-power, first of 220 h.p., either six cyl. Benz or eight cyl. Mercedes of two metres length, later a six cyl. Mercedes of 260 h.p.

When real air-fighting started, the Albatros, Friedrichshafen and Halberstadt D fighters were produced, confronting the Germans with their most difficult job of producing small and light aircraft of highest manœuvring capacity. Wherefore they cannot, in return for their first showing in efficient tackling of various aerial war stages, deny the direct British-French scout influence on the before-mentioned products.

This holds even for the E type, these being the Fokker and Pfalz Morane adaptation, with steadily increasing Oberursel (Gnome copy) motor power to the 160 h.p. limit, appearing by the middle of 1915 and not surviving the year of 1916.

The letter F has curiously enough not verified its type by any specimens, wherefore one proceeds to the G class and ventures to point it out as the initial of the "Gross-flugzeug" (giant aeroplane) class, represented by the Gotha A.E.G., Albatros and Siemens bombers, just as the D and E class coinciding with Doppeldecker for the scout biplane fighters and Eindecker for the corresponding monoplane type.

British Methods Conserve Spruce

In order to conserve the supply of spruce, of which a grave shortage exists owing to transportation difficulties, British aeroplane manufacturers are using hollow spars in almost any length, shape or size desired. Spars of all lengths and shapes have already been tested and proved to be equal, and more than equal to the best qualities of the solid wood, acording to "The Aeroplane."

The present methods of applying silver spruce to aircraft construction are considered very wasteful, when some fifty per cent. of the wood has to be cut out to get the requisite degree of lightness. Instead of this method of hollowing out, the Robert Young Construction Company are building spars of thin veneers glued together to the desired section, strength and shape, to any length, without joints. No matter what the length of the desired spars may be, no scarfing or other joint is required. These spars are one continuous length of uniform strength. The necessary provision for bolts and all other fixings required for wireless installations, etc., are provided for in the building up of the spar.

The same methods are adopted for building up the heavy bearers for engines, etc., and this is accomplished in a more satisfactory form that can be done at present with solid wood.

The struts and spars are all reinforced in their interior construction in such a way as to give the greatest resistance to all stresses and strains without adding to the weight. The most searching tests have proved that these hollow spars give a greater efficiency than any solid silver spruce spar. They have successfully passed the humidity tests, and are reliable in all climes.

This method of construction is the property of the Hollow Structure and Aircraft Company of England, and the Young Company is the exclusive licensee.

New Bomb for Fliers Invented by Student

A student in the University of Oregon battalion has invented a bomb that will explode at any given distance of "drop." The bomb can be hurled horizontally and will not explode, but when dropped it is so arranged that it will explode after any number of feet fall—the length of harmless fall being regulated by an attachment.

If the bomb proves satisfactory under tests now being made it will be turned over to the War Department for use by aviators.

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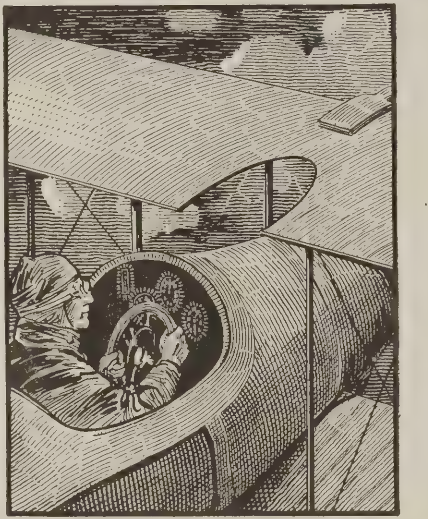

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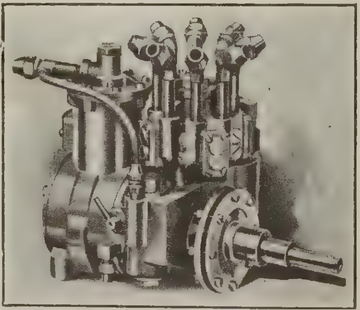

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AERIAL AGE
WEEKLY

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Three French Training Machines Maneuvering in Close Formation at an Aerial Review in France Witnessed by Secretary of War Baker

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Army Aeronautics Separated from Signal Corps by President Wilson's Order

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ARMY AERONAUTICS SEPARATED FROM SIGNAL CORPS BY PRESIDENT WILSON'S ORDER

PRESIDENT WILSON'S first act under the Overman bill, which he signed on May 20, was to effect a sweeping reorganization by separating all matters pertaining to the operation and production of aeroplanes from the Signal Corps of the Army.

Following is the statement of the Secretary of War:

> The Signal Corps will have only to do with signals and nothing to do with the production or use of aircraft.
>
> The Division of Military Aeronautics will have charge of the military use of aircraft and the training of aviators.
>
> The Bureau of Aircraft Production will have exclusive charge of the production of aircraft, aeronautical instruments and supplies.
>
> The order gives to Major-General Kenly custody of all property pertaining to the use of aircraft and the money designated for use in this connection.
>
> Mr. Ryan is given custody and authority over all property and money appropriated for construction of aircraft.
>
> This will in effect make both General Kenly and Mr. Ryan disbursing officers, obviating the necessity of having the funds pass through the hands of the chief signal officer.

The President's order covering both aircraft and the Signal Corps concluded with this statement:

> This order shall remain in full force and effect during the continuance of the present war and for six months after the termination thereof by the proclamation of the treaty of peace, or until theretofore amended, modified or rescinded.

The main branches of aircraft work—aeronautics and production—become independent organizations, related only in so far as is necessary to make the two harmonious. The fliers themselves will offer suggestions regarding the types of aeroplanes best suited to their purposes, but the equipment men will have the task of getting out the machines.

The new organization will require the addition of a considerable number of men and the shifting of officers now in the service. The new branches, which will operate under Secretary Baker's supervision, are defined by the proclamation thus:

The Chief Signal Officer will be in charge of all military signal duties, which is largely a matter of operation of military telegraph and telephone lines. A director of military aeronautics, who will be Major General William L. Kenly, will have charge of all aeroplanes and balloons and will direct aeronautics in general. Such material as is completed will be turned over to his charge. Lastly, an executive agency, to be known as the Bureau of Aircraft Production, will assume control of all pending aircraft projects and will undertake the production of needed aeroplanes and other aerial equipment.

Mr. A. A. Landon, vice-president of the American Radiator Company, recently named to leadership of production, will be the Production Bureau chief.

Newton D. Baker, Secretary of War, issued an order detaching three colonels from the high positions they have held in the production of aircraft. He announced that they would assist the Attorney General in the aircraft investigation which he is beginning with the help of Charles Evans Hughes.

The officers are Colonels S. D. Waldron, who was prominent in aircraft production work; Edward A. Deeds, who had much to do with the creation of the Liberty motor, and R. L. Montgomery, who dealt with accounts and contracts. Both Colonels Deeds and Montgomery, with Major General George O. Squier, chief signal officer, were the army representatives on the Aircraft Production Board.

NEW YORK—PHILADELPHIA—WASHINGTON AERIAL MAIL GREAT SUCCESS

Extension to Pittsburgh, Cleveland and Boston Proposed

THE New York-Philadelphia-Washington aerial mail line, inaugurated May 15, has proven a great success—and has proven conclusively the great value of the aerial mail service for training military aviators, and an extension to Pittsburgh, Cleveland and Boston is proposed.

May 15 was an exceptional day—the first real spring day enjoyed in this part of the country.

The Signal Corps and the postal authorities had made the plans for the aerial mail line with great speed and efficiency and everything was ready.

The aerial mail started simultaneously from New York and Washington at 11:30, on schedule time.

The New York Start

The Curtiss biplane left Belmont Park, L. I., with the first load of air mail at the scheduled time of 11:30. Three hours and 20 minutes later another biplane, similarly marked, which had relayed the mail from Philadelphia, as a fresh horse and courier used to relay it in the day of the post rider, descended in Potomac Park, Washington. The fastest trains between New York and the capital make the run in five hours.

A third biplane that was sped on its northward journey by President and Mrs. Wilson lost its way and had to land.

A fourth plane, which was waiting at Philadelphia to relay the Washington mail to New York, flew to Belmont Park with pouches from Philadelphia after news of the mishap in Maryland was received.

Quick Time Is Made

Its part of the transmission through cloudland was accomplished in an hour and 22 minutes, and the mail it brought was distributed from the New York Post Office one hour and twenty-three minutes earlier than if it had come by train.

Thus three-quarters of the Government's first day programme for regularly scheduled aerial mail service was successfully carried out. Philadelphia and Washington got their 24 cent an ounce letters from New York swiftly, if not quite as swiftly as had been expected, and New York received its mail from Philadelphia.

Lucky Pilots

The much envied Lieutenants who shared in this rare adventure were Torrey Webb, who carried the mail from Belmont Park to Philadelphia; J. C. Edgerton, who relayed it from Philadelphia to Washington along with mail starting at Philadelphia; George L. Boyle, who through no fault of his own came to earth in Maryland, and Paul Culver, who flew from Philadelphia to Belmont Park, New York.

The oldest of the four is not more than 25. They tried to act as if this was merely part of a day's work, but the crowds gathered to see them off or see them land were not to be fooled. They knew they were helping to make history, these buoyant young daredevils. The light in their eyes told that if nothing else.

The Post Office people were out to make a first day record. They did their part of the job with amazing speed. The two pouches made up at the main Post Office, Pennsylvania Terminal, snapped shut at 10:45 A. M. At 10:51 a special car of the Long Island Railroad was screaming through the tube on its way to Belmont Park. It stopped at the Belmont siding at 11:20.

While the car was still in motion the two sacks were thrown into the eager arms of Harry L. Hartung of the postal service. He flashed it across Belmont Park, across the running track in a flivver, and in three minutes from train to plane had conveyed his precious burden to Lieut. Webb.

In another two minutes it was stowed away in the aeroplane, and in another four, at 11:29 A. M., the propellers were singing their valedictory and the plane was leaping from the field.

Speech Interrupted

Lieut. Webb and his mount went about their business right in the middle of one of those lively speeches over by the hangars commemorating the day.

Alan R. Hawley, president of the Aero Club of America, was talking when somebody suddenly shouted, "There she goes!" The crowd around the speakers' platform turned to look across the running track, and there indeed "she" went. Either the schedule of speaking had gone wrong or the committee on arrangements had shrewdly fixed things so the aviator would not be pestered by a mob endangering itself and the machine by rushing up close.

Anyway, the first mail biplane departed in a manner seemingly impromptu, and the men and women who scampered toward it stopped to give three cheers as Lieut. Webb circled over the field and reaching the proper elevation—about 4,000 feet—streaked off to the southwest.

Behind his back was a mild breeze from the northeast that kept the flags on the Belmont grand stand fluttering. The aeronautical experts, including Alan R. Hawley, Henry Woodhouse, Rear Admiral Bradley C. Fiske, G. Douglas Wardrop, and others who watched the departure, called it a perfect day for flying.

Culver Welcomed

When the first mail plane had gone most of the guests who had gone from New York by special train by Postmaster Thomas G. Patten's invitation returned to the city. But somehow most of them, and a large part of the local population, were on hand again in the afternoon for the second big event—the arrival of Lieut. Culver with mail from Philadelphia. Culver was supposed to bring the Washington mail too, but when he learned in Philadelphia of his comrade's accident in Maryland, he started from the Quaker City at 2:15 P. M.

From the Government flying field at Mineola, a few miles to the northeast of Belmont Park, two scouts went out to meet Culver. When he was sighted they were followed by five machines, which swept over Belmont Park in V formation, as an escort to the homing pigeon. Far to the seawest the V circled like a flock of migrating geese and swept up behind the oncoming Culver's machine in triumphant procession.

Thus they came to Belmont field. The escort went on to Mineola, but Culver's Curtiss biplane spiralled twice and then took the ground and landed at almost the spot whence Webb had departed a few hours before.

The mail that Culver brought reached Belmont Park at 3:37 P. M., was on the Long Island mail car at 3:39, in the New York Post Office at 4:10. Two minutes later that part of it that was separated for distribution to sub-stations was shooting through pneumatic tubes, and by 4:18 the unsegregated mail was chasing it through the tubes.

Mayor Hylan, one of the invited guests, was not visible at Belmont Park. Among Postmaster Patten's guests who did appear were Alan R. Hawley, Admiral Fiske, Henry Woodhouse, John H. McCooey, Dock Commissioner Murray Hulbert, Byron R. Newton, Collector of the Port of New York; Sheriff David Knott of New York county; County Judge Burt J. Humphrey, and Mr. and Mrs. H. H. Webb, uncle and aunt of Lieut. Webb, who hails from California and is a Columbia graduate who has been flying about a year; Lieut. Dobel, a French ace, and Lieut. Harry Farre, the French war artist, and G. Douglas Wardrop.

Remarks pertinent to the occasion were made by Postmaster Patten. He said it was "a great historic moment in the transfer of intelligence."

"There may be lapses, as there have been lapses in other services," he added, "but in its beginning I know I shall receive the encouragement and co-operation of the people of New York, who are never asked to do anything that they do not successfully perform.

Newton Recalls Past

Collector Newton recalled to the listeners, many of whom had witnessed the scenes he referred to, of the brave spirits who soared over Belmont Park in the first aviation meet eight years ago, of the comparatively short period that had elapsed since Glen Curtiss was training at Rheims for the Bennett trophy, which he won.

Network of Lines

Mr. Hawley said the New York-Philadelphia-Washington aerial mail line is the beginning of a network of lines covering the world and dominating after war reconstruction. He felt certain that before the end of the year we shall see aeroplanes of 2,000 horsepower, capable of crossing the Atlantic. The Government needs hundreds of postal planes, he said, and idle factories should be set to work on them. He said Germany's plans for after the war embrace tens of thousands of aircraft, and that a nation that overlooks the simple fact that peace craft can be turned to war transportation by the simple substitution of bombs as cargo may pay dearly.

The last speaker—after the interruption—was Dock Commissioner Hulbert, who said the war on the western front was approaching a deadlock, that when football teams were deadlocked in midfield they kicked the ball, and that the way to break through Germany was through the air.

"We must have thousands and thousands of planes," he said, "for the dropping of tons and tons of bombs."

(*Continued on page* 554)

CHARLES E. HUGHES TO CO-OPERATE IN AIRCRAFT INVESTIGATION

PRESIDENT WILSON has summoned Charles E. Hughes to act with Attorney General Gregory in the investigation of criminal charges made in connection with aircraft production.

Mr. Hughes' acceptance of the task was announced May 15 at the White House.

This announcement overshadowed in interest any other development and created a great stir at the Capitol.

In designating former Justice Hughes, whose record in the New York insurance investigation is well remembered, the President said he felt the Department of Justice's investigation was of the very greatest importance. If any persons were found to be guilty they should be prosecuted vigorously and promptly he said, and the reputations of those attacked should be protected if the charges were found to be groundless.

The choice of Mr. Hughes to act with the Attorney General was met with expressions of satisfaction on all sides at the Capitol. Some Republican Senators voiced surprise, but there was not a suggestion of disapproval.

In asking Mr. Hughes to help in the investigation, the President said:

"You have doubtless noticed that very serious charges of dishonesty have been made in connection with the production of aircraft.

"Because of the capital importance of this branch of the military service I feel that these charges should be thoroughly investigated and with as little delay as possible in order that the guilty, if there by any such, may be promptly and vigorously prosecuted, and that the reputations of those whose actions have been attacked may be protected in case the charges are groundless.

"I requested the Department of Justice to use every instrumentality at its disposal to investigate these charges, and, with the approval of the Attorney General, I am writing to beg that you will act with him in making this investigation. I feel that this is a matter of the very greatest importance, and I sincerely hope that you will feel that it is possible to contribute your very valuable service in studying and passing upon the questions involved."

The President's letter to Mr. Hughes was written Monday, May 13th and the reply came on May 15th, just before the announcement that the former justice had accepted the task. Mr. Hughes wrote:

"I beg to acknowledge receipt of your letter of May 13. Appreciating fully the gravity of the matter, I shall be glad to co-operate with the Attorney General in making a prompt and thorough investigation of the charges of dishonesty in connection with aircraft production. You may be assured that nothing will give me greater pleasure than to render any assistance within my power.

"I assume the Attorney General will advise me of his wishes for a conference with a view to the making of definite and adequate plans for the investigation, and I shall endeavor to arrange my affairs so that these plans may be carried out with as little delay as possible.

Charles Evans Hughes arrived in Washington May 18 and with characteristic energy began to lay the basis for the investigation of the aircraft situation. He went into conference with the Attorney General and various departmental officials soon after his arrival in the capital.

The Attorney General explained that he had requested Mr. Hughes to make an exhaustive inquiry into all the facts of the case, especially with a view to discovering whether there had been any graft or dishonesty in connection with aircraft contracts.

The Secretary of War, Mr. Baker, was called into the conference for a time, Brigadier General C. McK. Saltzman and Major Dana C. Beatty, of the administrative division of the old Signal Corps, who now are in the military aeronautics division, went over certain aspects of the aircraft situation with Mr. Hughes and William L. Frierson, Assistant Attorney General, who has been designated to conduct the inquiry.

At the close of the long conference, Mr. Hughes said that he had merely been going over the evidence that had been collected by the War Department and the Department of Justice with a view to determining upon the course to be followed in the investigation.

THE NEWS OF THE WEEK

Aero Mail Appropriation in Post Office Bill

Washington, D. C.—The $381,000,000 post office appropriation bill includes $100,000 for aerial mail service. The bill provides for wage increases to postal employees and for the construction of pneumatic mail tubes.

National Research Council to Coordinate Scientific Research

Washington, D. C.—The National Research Council, organized in 1916 at the request of the National Academy of Sciences under congressional charter, has been requested by President Wilson to perpetuate its work under the auspices of the Academy. Its duties are to stimulate research in mathematical, physical, biological, medical and engineering sciences; to formulate comprehensive projects of research and to utilize the technical resources of the country in carrying them out; to promote co-operation in research and eliminate duplication; to bring American and foreign investigators in active co-operation with the scientic and technical services of the War and Navy Departments, and to collect and coordinate scientific information.

War Labor Board Announces Rules for Taking Up Industrial Disputes

Washington, D. C.—The National War Labor Board has issued an official announcement regarding its method of dealing with industrial disputes. It provides for the appointment of subcommittees composed of two members to act for the board in every local controversy, and the appointment of permanent local committees in cities and districts to act in cases arising within their districts. The board itself will sit in hearing upon cases only when its subcommittees or local committees find it impossible to settle a controversy. In compliance with the direction of the President's proclamation, the board will hear appeals in the following cases: (1) Where the principles established by him in such proclamation have been violated; (2) Where an award made by a board has not been put into effect, or where the employees have refused to accept or abide by such award; and (3) To determine questions of jurisdiction as between Government boards.

Captain Silvio Resnati Killed at Mineola

Mineola, L. I., May 18.—Captain Silvio Resnati, of the Italian Royal Flying Corps, sent here by his government to demonstrate the Caproni warplanes in the United States, was killed when testing a Caproni aeroplane. The machine fell from a height of only 100 feet, and Resnati was crushed by the falling motor.

Captain Resnati was one of the most popular officers who ever visited this country. His wonderful aerial feats have been daily witnessed by the thousands of troops at Camp Mills coming from all sections of the United States. He recently flew over New York City in connection with the Liberty Loan Campaign.

General Pasquale Tozzi, Chief of the Royal Italian Military Mission, arrived from Washington with the members of his staff to attend the funeral. Captain Resnati was buried with full military honors. The Caproni biplane in which the late Captain Resnati made the record flights from New York to Washington and Norfolk to New York followed the funeral train, piloted by Captain Hugo D'Annunzio.

A. A. Landon Made Chief of Plane Production by A. F. Ryan

Archer A. Landon, of Buffalo, N. Y., formerly vice-president of the American Radiator Company, has been placed in charge of aeroplane production by Alan F. Ryan. Without having an official connection with aircraft production, Mr. Landon has made a study of the shortcomings in the present program. Mr. Landon has had wide experience in production problems, especially in connection with his work with the American Radiator Company, which operates a large number of plants in this country, and before the war was one of the largest manufacturers in Europe.

Board to Select Aviation Sites on Long Island Sound

Washington, D. C.—A board to consist of Lieut. Col. Lewis E. Goodier, Jr., Signal Corps; Major Attilio M. Caccini, Medical Reserve Corps, and Mr. W. P. Stevens, production expert, S. S. L., has been appointed by the Aviation Section of the Signal Corps to meet at Mineola, Long Island, for the purpose of selecting aviation sites on Long Island Sound.

Major Raoul Lufbery, officially credited with eighteen victories, was killed in France while flying with the American forces

Major Raoul Lufbery Downed by German Three-Seater Plane

With the American Army in France, May 20th (Associated Press dispatch).—Major Raoul Lufbery, the American "ace of aces," credited with eighteen victories, was shot down in flames and killed by a large three-seater German triplane. At about 10 o'clock Sunday morning a German triplane suddenly descended from the clouds, apparently because of engine trouble, until it was some 1,500 meters over the city of Toul. Luberry, in his Nieuport combat plane, gave chase, followed by two American machines. The enemy made for his own lines, and when eight miles away, Lufbery was seen to attack from under the tail, but then he drew off as if his machine gun had jammed. Two minutes later he attacked again from the same position and almost immediately his machine burst into flames. Those on the ground suddenly saw his form jump from the machine. Lufbery's body fell some 400 yards from his machine.

Major Lufbery was known throughout the American army and in the French air service as "Luff," and was one of the most daring fliers on the front. Lufbery had just returned from a leave several days before his time was up, believing that he was needed in combatting the German effort at aerial supremacy. He has been awarded the Croix de Guerre, the British Military Cross, the French Medaille Militaire and the Legion of Honor.

It was Lufbery's ambition to die fighting. He was popular not only because of his exploits in the air, but for his colorful, picturesque personality and career. Lufbery was an American by paternal citizenship, a Frenchman by birth and devotion, being born in Clermont, France, thirty-four years ago.

Before being transferred to the American Air Service, Lufbery served in the Lafayette Escadrille. His numerous victories and daring brought him international fame.

The type of aeroplane which overcame Major Lufbery is described in the New York *Times* as being a low-powered slow speed machine, which depends more on heavy armor and heavy guns than on manoeuvering ability and speed, for its fighting power. The weight of the plane is probably between 3,600 and 4,000 pounds and therefore comparatively slow and clumsy.

Lieut. Silvio Resnati, the famous Italian aviator who was accidentally killed while testing a Caproni machine at Mineola

James Gordon Bennett Was Patron of Aviation

In the death of James Gordon Bennett, aeronautics has lost one who had identified himself with aeronautic progress almost since the inception of the movement. "Without question," Mr. Alan R. Hawley, president of the Aero Club of America, said upon receiving the unfortunate news of his death, "James Gordon Bennett was the patron saint of aviation, both in America and abroad. He was elected an honorary member of our club when it was organized, in 1906, and ever since has been actively identified with the development of aeronautics." Mr. Hawley also said that Mr. Bennett's editorials were an important factor in securing the large aeronautical appropriation passed last year.

President Authorized to Appoint Aircraft Dictator

Washington, D. C.—The passage of the Overman Bill by the House of Representatives on May 14 empowers President Wilson to appoint an aircraft director, who is vested with executive authority. The Overman Bill still further concentrates power in the hands of the Chief Executive, giving him a very free hand in the prosecution of the war.

The section of the Overman Bill relating to the appointment of the aircraft dictator reads as follows:

"Section 6. That the President is further authorized to establish an executive agency which may exercise such jurisdiction and control over the production of aeroplanes, aeroplane engines and aircraft equipment as in his judgment may be advantageous, and further to transfer to such agency for its use all or any moneys heretofore appropriated for the production of aeroplanes, aeroplane engines and aircraft equipment."

H. P. Davison Stunned by German Air Bomb

H. P. Davison, head of the American Red Cross, who has just returned to this country after an extended visit to the front, related his experiences to representatives of the press. In his description of the extensive and efficient work of the American Red Cross, it was brought out that while passing through the French town of Chalons, Mr. Davison was stunned by a bomb from a German aeroplane.

Five in Fast Flight in a Liberty Plane

Washington, May 21.—A navy seaplane recently completed at the Naval Aircraft Factory, Philadelphia, has made a flight from Philadelphia to Hampton Roads, about 220 miles in a straight line, in three hours and fifteen minutes. The plane is equipped with two Liberty motors and carried five passengers, including the pilot.

Fowler Corporation's Factory in San Francisco Scene of Disastrous Blaze

San Francisco, Cal., May 21.—Fifteen aeroplanes in various stages of construction and a considerable quantity of dried spruce and Irish linen were reported destroyed here to-day in a fire which swept the plant of the Fowler Airplane Corporation.

The fire started, in a furniture factory and swept a block, destroying several apartment houses. The Fowler concern was working on government contracts and the stock on hand was estimated to be worth from $250,000 to $1,000,000

Lieut. Torrey Webb, who piloted the first machine carrying mail from New York to Philadelphia

New Bureau of Standards Laboratory

The Department of Commerce, Bureau of Standards, has authorized the construction of a $1,000,000 building for an industrial testing laboratory, which will be among the largest, if not the largest, in the country. The cost was announced as $650,000, but this estimate is expected to reach close to $1,000,000 by the time the building is finished. It will be four stories in height, covering an area 350 by 167 feet.

Naval Consulting Board Compliments Coffin

Washington, D. C.—An appreciation of the work of Howard E. Coffin, retired Chairman of the Aircraft Board, was adopted by the Naval Consulting Board and telegraphed to Mr. Coffin. The text of the resolution is as follows:

"The Naval Consulting Board at its session in Washington to-day (May 4) sends its most cordial greetings to its member, Mr. Howard E. Coffin, with best wishes for his speedy recovery to full health and vigor, and take this occasion to record that at that critical time when the new aeroplane program was planned there were few men in America who had the vision, foresight and imagination to recognize that hundreds of millions of dollars should be appropriated for aerial equipment, and fewer still who were capable of organization for the effective expenditure of such vast sums of money for national defense. Among these he was foremost. The board further resolved that this resolution be transmitted by telegraph to Mr. Coffin at his Georgia home."

Washington Service Bureau to Direct Visitors

Washington, D. C.—A Service Bureau has been established by the Government in the Home Life Building, 15th and G Streets, to direct the thousands of persons who arrive daily in Washington, including salesmen and manufacturers, to get to the proper Goovernment department. The bureau will also give information concerning Government activities, care for letters and persons trying to reach members of Congress, and assist Government officials in getting in touch with special offices and departments.

Kettering Addresses Engineers

Chicago, Ill.—In an address before the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the Western Society of Engineers recently, Mr. C. F. Kettering, president of the Society of Automotive Engineers, predicted the future of the internal combustion engine, indicating that greater thermal efficiency will be secured. Mr. Kettering also touched on the developments leading to the design of the Liberty engine.

New Navy Flying Boat Tested

New York City.—A new hydroaeroplane, driven by a Liberty motor, was tested over Flushing Bay last week, designed for Coast Defense work. The test was conducted under the direction of the Naval Aviation Board, with Ensign Slater as pilot and Lieut. Wessen as observer. It is said that a favorable report has been made on the conduct of the craft.

War Zone Plane of War Industries Board to Solve Transportation Problems

Charles A. Otis, a Cleveland manufacturer and member of the Chamber of Commerce, will undertake the organization of industrial zones—each to constitute practically a complete economic unit for war work. The zone organizations are to be built up around chambers of commerce, which will act as information and service bureaus, both for the Government and manufacturers seeking contracts. Each zone bureau will be headed by an industrial expert.

Under this organization plan, manufacturers who buy parts for assembling will be instructed as to firms in their zone offering such parts. Factories will be informed of raw materials close at hand, and the wasteful practice of sending across several states for supplies obtainable nearer home will be abolished.

Signal Corps Will Move to New Building

Washington, May 15.—Three thousand clerks of the United States Signal Corps, now scattered throughout the city in ten buildings, will be grouped together in the new War Department structure, located at Four-and-a-Half and Missouri Avenue northwest. This structure contains about 30,000 square feet of floor space and includes eight wings.

Offices of the Signal Corps are now located in the Arcade Building, the Banister Building, the old Masonic Temple, and at 1607 H street northwest, 1719 Pennsylvania Avenue northwest, 136 K street northeast, 1333 F street northwest, 221 F street northwest, 1327 F street northwest, and 1703 New York avenue northwest.

Major R. H. Fleet, in charge of the military aviators assigned to aerial mail duty

The new building has been erected in about three and a half weeks.

It is constructed of wood and lined with Compo Board. The central plant which furnishes heat to the Ordnance Corps and Surgeon General office buildings will heat the new structure. Eighteen hundred men were at one time working on its construction.

The work of transferring offices scattered all over town to the new structure will begin June 1. The War Department will still continue to occupy the buildings vacated by the Signal Corps.

Caproni Biplanes for Signal Corps

Washington.—According to advices from Washington, it is reported that the Signal Corps has decided upon the construction of a number of Caproni biplanes for use for the American army in France. Although no contracts have been reported, the statement was made that quantity production will be well under way by the end of the year.

Under the auspices of the Italian Aeronautic Mission, the Caproni biplanes have been flown in this country for some time, and have gained a remarkable reputation among officials here.

Camp Dick Holds Athletic Meet

Dallas, Tex.—The athletes stationed at Camp Dick, near Dallas, held a very successful athletic meet in the presence of one of the biggest and most patriotic assemblages that Dallas has ever seen. Athletes from the University of California aviation ground school, Berkeley, Cal., overwhelmed all opposition and won the meet. The scores were as follows: California, 42; Princeton, 21; Austin, 18; Cornell, 8; Illinois, 6; Ohio, 5; and Fort Sill, 5.

Templeton, of California, was the individual star of the day, contributing three first places to his school's credit. Charles Stout, of the University of Texas, won the mile race with ease, while Hayes, of Princeton fame, came in first in the 880 yard run. Many other athletes of university fame participated in the meet, which was a success from every standpoint.

A fleet of twenty-four aeroplanes from Benbrook and Love Field, led by Captain Dodd, entertained the spectators with formation flights and individual stunts and tricks.

At the Army Aviation Fields

The aviation field at Loanoke Field, Arkansas, is in full swing. The commanding officer of the field is Major Fizzell, and Major Peabody is in charge of flying. The stage commanders are as follows: Dual, Lieut. Duddleston; Solo, Lieut. Harvey; Acrobatic, Lieut. Kenne; Cross Country, Lieut. Banks; Formation, Lieut. Bruce.

Col. Robert C. Disque has been appointed by the Chief Signal Officer of the Army to take charge of the Air Service Division School for Radio Officers at Columbia University, New York.

First Lieut. Edward R. Lindabury has been placed in charge of the construction of the Signal Corps Aerial Gunnery School at Miami, Florida.

With Our Boys "Over There"

Sergt. Frank L. Baylies, of the "Stork" Escadrille of the French Air Service, has downed his ninth German machine. His victories have been won in a remarkably short time, having won his first victory on February 19.

On May 15 American airmen operating in the Toul sector shot down three enemy planes.

Capt. Norman Hall, who was reported as missing last week, was, according to a dispatch, decorated with a war cross.

Major Ralph Royce, of Hancock, Mich., has been decorated with the French War Cross by a French corps general for making a successful reconnaissance flight over enemy lines. Among other American airmen recently decorated are Capt. David Peterson, of Honesdale, Pa.; Lieut. Charles Chapman, Lieut. E. V. Rickenbacher, Lieut. James Meissner and Lieut. Myers, of Milwaukee.

General Pershing's communique, issued by the War Department on May 19, reports the following aerial activity on the part of the American forces:

"Last evening north of Toul, Lieut. Rickenbacher, flying at 5,000 metres, was pursuing an albatross type plane when a second machine came between them. Lieutenant Rickenbacher struck the tail of the second machine, taking it off and apparently forcing the hostile plane down out of control. Although his own machine was badly damaged, he succeeded in returning safely to his own lines.

"At about the same time Capt. Peterson attacked a two-seated machine in the vicinity of St. Mihiel. The enemy machine descended in a nose dive.

Lieut. Culver, who carried the first mail from Philadelphia to Washington

President and Mrs. Wilson and group of eminent citizens, who gathered in Potomac Park, Washington, to witness the inauguration of the first aerial mail service between Washington-Philadelphia-New York. The President evinced great interest in the event

The group of aeronautic enthusiasts who journeyed to Belmont Park to see the inauguration of the first aerial mail. From left to right they are: Dock Commissioner Murray Hulbert, Alan R. Hawley, President Aero Club of America; Henry Woodhouse, a Governor of the Aero Club of America; Postmaster Patten of New York City, Collector of the Port Byron R. Newton, Lieut. Torrey Webb (consulting the map), and the military officer in charge of the field. Mr. F. S. Beckwith, secretary of the Hamilton Watch Co., is handing the two aviators the wrist watches presented to all the aerial mail pilots by Mr. Charles F. Miller.

"Lieut. Chambers, at about the same time, engaged two hostile machines. One was seen to fall."

Ensign E. A. Stone and Sub-Lieut. Eric Moore, who had been given up for drowned in the Channel last month, have arrived safely in London. After drifting for eighty hours in their seaplane, which was forced down on account of motor trouble, they were picked up numb and helpless by a destroyer.

Large Attendance at S. A. E. Meeting in Detroit

Detroit, Mich.—Over 300 tickets have been sold for the Orville Wright dinner to be held in connection with the Summer meeting of the Society of Automotive Engineers at Dayton, Ohio, Monday and Tuesday, June 17 and 18. The program of papers which will supplement the various exhibits and demonstrations include one of the question of propeller manufacture, which will be supplemented by a specially installed machine for showing the manufacture of a propeller. Another paper will deal with the various types of modern planes and the characteristics of each, and a third with comparisons of aeroplane engines.

Army Asks Fifteen Billions

Washington, D. C.—As prepared for submission to the house this week, the annual army appropriation bill carries $11,771,666,000, exclusive of the estimate for heavy ordnance and fortifications, which totals about three billion.

At the Aviation Training Schools and Camps

The naval aviators at the Massachusetts Institute of Technology are to form a track team and have the nucleus of one that will be hard to surpass anywhere in the country. Among the lads working out three days a week are H. C. Weeks, who recently won second place in the five-mile run at the A. A. U. senior meet; Foss of Cornell, the former intercollegiate pole vaulter; Drew, of Colby; Hass of Bowdoin; Gills, of Cornell; Lefty Flynn, the former Yale star hammer and shot put; Wingate Rollins, former sprint star at Harvard; R. H. Griffin of Dartmouth and Mark Noble. For the 100 and 220 yard dash there are such star performers as Lockwood of Pennsylvania; O'Bryan of Kentucky; Smith, of Indiana and Holt of Amherst.

The base ball craze is blossoming more fully each day at Chanute Field and it looks as though every squadron on the field will have more than one team this summer. The members of the Medical department at the post hospital also have fallen in line. Practice is held each evening in hopes of developing some real camp champions. The medical men are fortunate in having an ex-ball player for top sergeant. He is Sergt. Onnie E. Walker, a Chicago boy with a pitching arm and a batting eye that seldom fail. He is assisting his men in practice and hopes to round up a fast team. Clarence Baker, the Medico boxing champion is also a pitcher on the ball field and will strengthen the team considerably. A captain and manager are to be chosen some time this week.

Hon. William Frierson, Assistant Attorney General, who is representing the Department of Justice in the Aircraft Investigation

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Aviation recruits have been arriving at the Camp Kelly aviation field lately at the rate of 1,000 a day to fill the places of men who have already qualified for the flying and mechanical needs of the aviation service and been advanced further toward the front. As fast as the men arrive they are organized into squadrons and their preparation for overseas service is rushed rapidly.

The recruits come from widely separated places, but most of them are from Fort Slocum, New York; Columbus Barracks, Columbus, Ohio; Jefferson Barracks, St. Louis, Mo.; Jackson Barracks, New Orleans, and Fort Logan, near Denver.

Men of all trades are received at this camp, and fitting the right man in the right place is one of the big problems officials have to face. In this section of the Signal Corps men of many trades are used in training activities and in keeping the flying machines in tip top condition.

Flying will begin in earnest at the aviation fields here near Camp Mills, L. I., and the students who have come from Texas, Louisiana and other fields will finish their education under the most expert instructors. All that remains for these birdmen before they go to the other side is to take final instruction here at Field No. 1:

The aeroplane of the Aviation Reserve Corps, New York City Police Department, in the recent police parade

Experienced aviators from France, England and Italy will take a hand in this polishing. These men have been in actual conflict and know exactly what the new aviators will have to undergo. American officers will assist in this final work.

Major Thomas Hitchcock will have charge of all training. Various types of machines will be used, so the flyers may learn to handle more than one make.

Major E. J. Canady will be in command of Field No. 1 and Lieut. Col. Ostermann of Field No. 2.

Our Fliers "Over There"

American airmen who have returned from the flying school in Italy for advanced training in France as pilots praise highly their Italian instructors. They tell of unusual adventures, including a story about an American pupil who was captured by peasants and held as a prinsoner until one appeared who had been in New York and spoke English.

"We found so many Italians who spoke English that we did not have to learn their language," said a pilot from Philadelphia who had been training in Italy for six months.

"It was a common saying that English is spoken everywhere in Italy, and if every Italian who declared his intention of going to America after the war did so there would not be many left at home. I was forced to land in a desolate country, far from the aviation field or any railway, but the first peasant who came along greeted me warmly in English and gave me every assistance.

Italian, British, Frencn and Belgian societies held a meeting in Turin, Italy, recently in order that Captain Fiorello H. La Guardia, Representative from a New York City district and a member of the American Flying Corps, might address the people of Turin on his way to the front.

Captain La Guardia's address was based on President Wilson's speech at Baltimore on April 6 and his frequent, direct quotations from the speech created a profound impression. The meeting closed with a warm demonstration in favor of the United States.

To North Pole by Aeroplane, MacMillan's Plan

A round-trip passage from Cape Columbia to the North Pole in nine hours will be possible soon by aeroplane, according to Donald MacMillan, Arctic explorer and scientist. He says he has formulated a complete plan for aerial voyages, after consultation with aviation experts, and the aeroplane is the only sensible means of transportation to the Pole.

"To get to the North Pole by aeroplane," Mr. MacMillan explained, "the proper plan would be to establish a base at Eath, in northern Greenland, to which point a good stanch ship can go any summer from Boston or any other port.

"With Etah as headquarters a provision and oil station could easily be advanced to Cape Columbia, the most northern point of Grant Land. From this point to the North Pole the distance is 413 miles, which would make a round trip of 286 miles.

"Aeroplanes today can make sustained flights of nearly 1,000 miles at a speed of 100 miles an hour. As the journey from Cape Columbia to the Pole and back could easily be accomplished in between eight and nine hours, an oil station could be safely established 200 miles from land; it could be intrusted to the drift ice for at least one day."

Grocery Boy Comes Ninety Miles by Aeroplane

At San Diego an aerial delivery line for groceries has been put into operation. These flights are being made to bring supplies to the mechanicians now at work in Riverside, where a new flying field is being prepared. Daily trips will be made as long as they are necessary. The distance between the two points is about ninety miles.

Meteorologists and Physicians Are Needed in Army Aero Service

A call has been received at the Military Intelligence Bureau of the University of California for ninety-five meteorologists and fifty physicians for the aero division of the Signal Corps. Either voluntary enlistments or drafted men will be accepted and they will be sent to Fort McArthur, Waco, Texas.

The meteorologists will supervise the work of making and recording observations of atmospheric conditions and should be familiar with measuring and indicating instruments. They should also have had experience in the following: Atmospheric observation, tabulating, charting, forecasting, plotting curves, isothermic and isobaric charts.

The physicists should have had experience as observers or operators in laboratory or field work and should be familiar with laboratory and testing instruments such as galvonometers, microphones, etc.

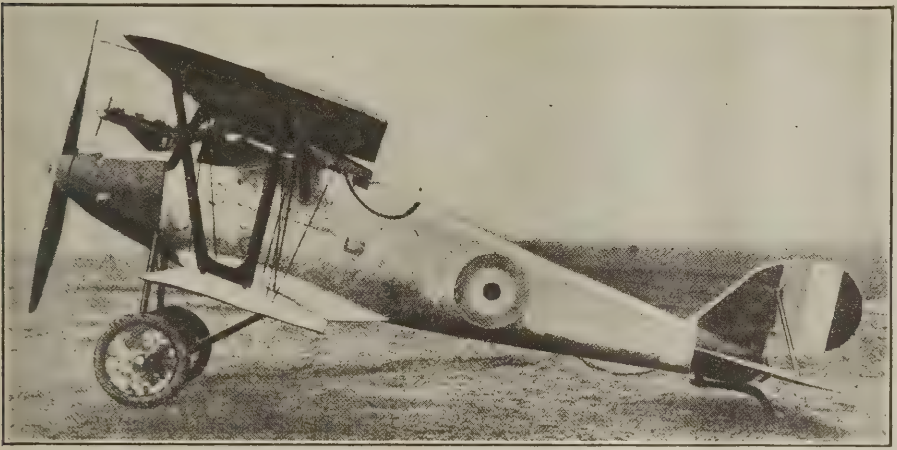
The AIRCRAFT TRADE REVIEW

With the Aircraft Manufacturers

The Myers Aircraft Corporation, New York, has been incorporated in Delaware, with a capital of $1,000,000 by George V. Reilly, Samuel B. Howard and Arthur W. Britton, 28 Nassau St., New York.

The Lanzius Aircraft Company, Middletown, Pa., is planning to increase its plant capacity. It is stated that the present floor space will be doubled.

The Airplane Safety Appliance Corporation, Brooklyn, has been incorporated with a capital of $20,000 by A. B. Cohen and J. V. McDaid, 83 Richmond St., Brooklyn, N. Y.



Side view of the Pfalz single-seated fighting plane. French Official Photo.

The S. K. F. Ball Bearing Company has awarded a contract for an addition, 125 by 200 ft., two stories high.

The Fisher Body Company, Detroit, has let a contract for an aeroplane factory to be erected on West End Avenue and Fort Street, Detroit, Mich.

The H. W. Johns-Manville Company has acquired a new office at Houston, Tex, at 426 Washington Avenue, and will vacate their old quarters on July 1.

Personal Pars

Lieutenant Henry Seymour Houghton, now stationed at Gerstner Field, Lake Charles, La., was married to Miss Natalie Budd, of New York City. Lieutenant Houghton is a son of the late Dr. H. Seymour Houghton, formerly President of the Medical Society of the County of New York.

Mr. John Weiss, formerly with the Curtiss Engineering Company, Brooklyn branch, has been appointed factory inspector of metal parts at the Breese Aircraft Co., at Farmingdale, New York.

How to Use Brazing Solder and Wire

Waterbury, Conn.—The constant demand from users of brazing solder and wire for information as to its use and the proper handling of the product with a flux has caused the American Brass Company to prepare a booklet giving full information covering the different meshes, alloys and melting points. The American Brass Company has manufactured brass spelter solder in coarse and round grains, in several lump and mesh forms, which is used by many of the large manufacturers of automobiles, trucks, motorcycles and aeroplane motors.

Government Regulates Felt Output

Washington, D. C.—To insure adequate supplies of felt for Government needs and to regulate, through a licensing system, the manufacture of felt for civilian needs, Sylvan Stroock, of the War Industries Board, has been placed in charge of the entire production of felt in the United States.

Shortage of Tool Makers

Washington, D. C.—The Department of Labor announces that a shortage of tool makers and mechanics in munitions factories has resulted in reducing the output of such factories to 75 per cent of capacity.

Stewart-Warner Claims Infringement

Chicago, Ill.—A recent decision here confirmed the validity of the Stewart-Warner patents, but denied that they have been infringed by the Thermo-Vacuum system. The Stewart-Warner Company will appeal the decision.

British Engines to Be Made Here

Washington, D. C.—It is reported that the interests behind the British Sunbeam engine are about to place orders in the near future with American manufacturers. The Willys-Overland Company has been manufacturing this engine in its Toronto, Ont., factory and making parts of it in many of the American factories.

It is reported that orders have also been placed for the S. P. A. engine with the Willys-Overland Company, which company is reported to start production on this job, according to "Automotive Industries."

Detroit an Automotive City

Detroit, Mich.—The Detroit Section of the Society of Automotive Engineers has enrolled 104 associate and active members since December 4, 1917.

War Trade Board to End Tonnage Waste

Washington, D. C.—The War Trade Board is holding numerous conferences with a view to restricting all shipments on ocean-going vessels, and determining if any further restrictions can be imposed without preventing shipment of necessary material abroad. Among the industries being considered are rubber, tin, leather, etc. No restrictions will be put into effect until thorough consideration has been given by the Board as to their effect both here and abroad.

Oil Exports Increasing

Washington, D. C.—Exports of gasoline, mineral oils and other petroleum products have increased greatly in value, but only slightly in volume. During the month of March, the exports of gasoline and naphtha amounted to $11,930,980. The total value of mineral oils exported amounted to $52,834,069.

Spruce Prices Increase Greatly

Washington.—The price of spruce to the Government has increased greatly in the last eight months, amounting, in some cases, according to "Automotive Industries," to 80 per cent. High grade spruce which brought about $100 per 1,000 feet a year ago, now costs $150, owing to increased production costs. Contracts made in February at $130 are far from filled, as many men have been drafted. The Canadian Government has made several contracts for spruce at $160 per thousand feet.

Steel Exports to Canada Cut

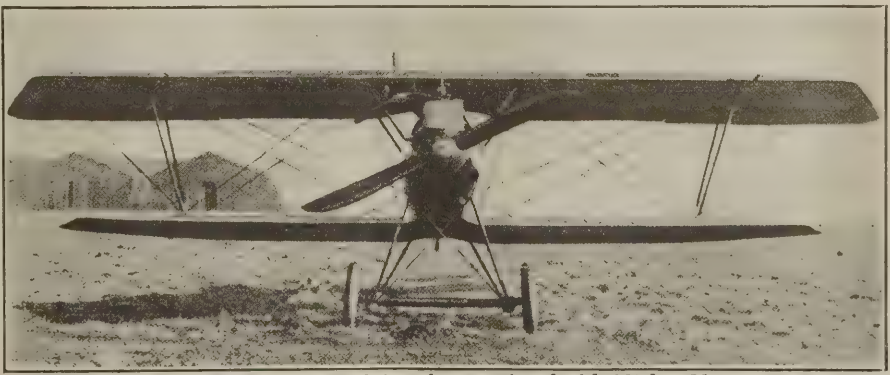
Toronto, Canada.—The concentration of the American iron and steel industry on war work has cut down the imports into Canada to pig iron and steel, so that there will be no importation here for warehouse purposes. The result has been an increase in the price of machine tools and supplies. Canada is now feeling, more than ever, the tremendous demands of war industry.

Germany Plans After-War Air Service

Paul Gratz, a well known African explorer, has interested certain Bavarian circles in founding at Munich a company which is to serve as a basis for "Central European aerial traffic."

The participants so far include the Prince of Thurn and Taxis, the cities of Munich, Nuremberg, Augsburg, Regensburg, Bamburg, and Lindau, and representatives of industry, finance and commerce. Gratz has also interested the Austro-Hungarian Government, the Austrian Lloyd, and the Deutsche Bank of Berlin, as well as the Hamburg-American Company.

Bavaria's location in the heart of Europe, Gratz thinks, ought to justify establishing there a central station for mid-European aerial traffic, especially since the atmospheric conditions are very favorable. The first two aerial station will be erected at Munich and Regensburg. They will serve for testing the plan.



Front view of Pfalz single-seated fighting plane, equipped with 160 h.p. Mercedes engine. French Official Photo.

CALCULATION OF STRESSES IN AEROPLANES

By S. E. SLOCUM, Ph.D.

Professor of Applied Mechanics, University of Cincinnati, Member S. A. E. and Aerial League

(*Continued from page* 501)

Factors of Safety

THERE is at present a wide difference among designers of aircraft as to the factors of safety and other empirical constants used. The greatest need is for standardization of methods of design and construction, and the service being rendered by the S. A. E. and similar organizations in this direction is therefore of special significance. For instance, specifications for biplanes often require that the upper plane be made strong enough to carry the entire load. Such a requirement, however, is purely arbitrary; a more rational method of procedure being to so dimension the members that the structure shall be of uniform strength throughout. The chief difficulty, of course, is to determine the maximum load produced by air gusts and certain manoeuvres such as banking, etc. Experience has shown, however, that the maximum load due to the most unfavorable combination of circumstances does not exceed about five times the normal load. This alone would therefore require the use of an initial factor of safety of 5 throughout. Besides this it is necessary to allow for a small structural factor of safety of say 2 or 3 to cover material defects. The product of these two will then be the required overall factor of safety, which under these assumptions will range from 10 to 15. This method will be adopted in what follows as being the most rational procedure.

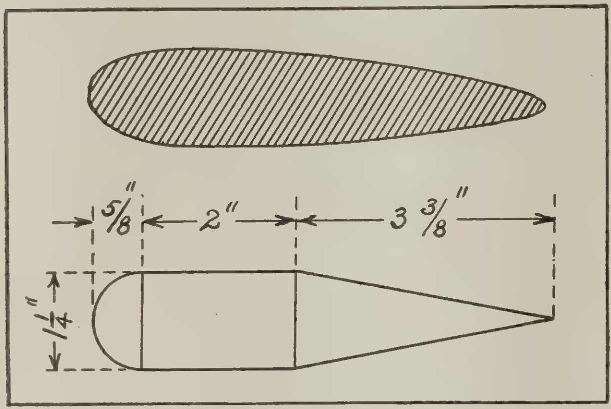


Figure 10. (Above). Section of streamline strut. (Below). Section assumed for computation

Size of Diagonals

The main diagonals are usually composed of two wires, as in this case with the factors of safety used, the failure of one wire will not cripple the machine. The following table gives the International Aircraft Standards for the strength of 7 x 19 strand cable.*

Strength of 7 x 19 strand cable.

Diam. in inches.....	1/8	5/32	3/16	7/32	1/4	9/32	5/16	11/32	3/8
Breaking strength in pounds..	2,000	2,800	4,200	5,600	7,000	8,000	9,800	12,500	14,400

Since the tension in the diagonal BF has been determined as 605 lbs. for a factor of safety of 10 the total strength to be developed must be 6,050 lbs., or, since two wires are used, 3,000 lbs. per wire. Referring to the above table, this diagonal will therefore be made up of two 5/32" wires. The counter AG which carries the landing stresses is usually made half as strong as the main diagonal, requiring in the present case one 5/32" wire.

For the diagonal CG the load was found to be 326 lbs., which for a factor of safety of 10 gives a breaking load of 3,260 lbs., requiring two 1/8" wires for the main diagonal, and one 1/8" wire for the counter BH.

Size of Struts

Until recently there have been no reliable formulas for the strength of struts of the dimensions and material used in aeroplanes. Perhaps as reliable and convenient formulas as any now available are those based on experiments made at the Mass. Inst. of Tech. in 1915 on spruce struts with hinged ends, which are as follows:—

$$\text{For } \frac{l}{k} < 70 \qquad \frac{P}{A} = 6500 - 46.5\,\frac{l}{k}$$

$$\text{For } \frac{l}{k} > 70 \qquad \frac{P}{A} = \frac{8.72\,E}{\left(\frac{l}{k}\right)^2}$$

where P = breaking load in lbs.,
A = area of section in sq. in.
l = length in inches,
k = least radius of gyration in inches,
E = modulus of elasticity = 1,825,000 lbs. per sq. in.

The overall factor of safety recommended for use with these formulas was from 8 to 16, which covers practically the same range as that adopted above, namely from 10 to 15.

The compression members, or struts, in the lift truss are made streamline in section as shown in Figure 10, in order to diminish the head resistance or drift. The ratio of width to depth for minimum drift may be taken as about 1 to 6. In the present case, therefore, assume a depth of 6" and try different widths, beginning with 1¼".

In order to find the breaking load for the strut it is first necessary to calculate its least moment of inertia. This can be found graphically for any irregular section, but as the process is unfamiliar to most engineers it will be sufficient in the present case to approximate to it by ordinary methods.

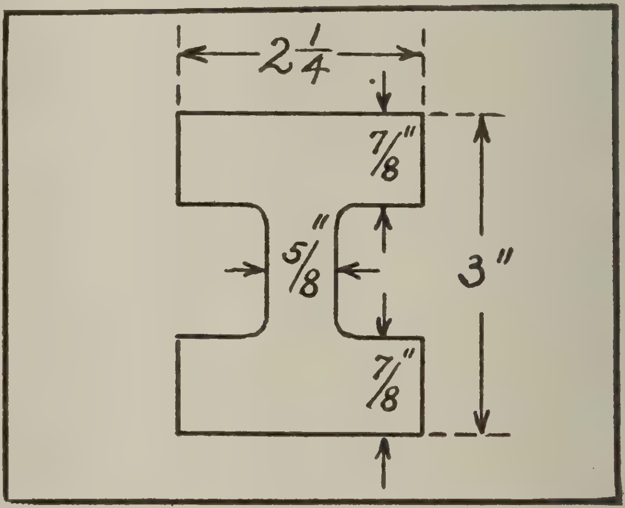


Figure 12. Section of front spar

For this purpose divide the section up into three parts, as indicated in Figure 11, namely, into a semicircle of radius 5/8", a square 2" x 1¼" in size, and a triangle of base 1¼" and altitude 3⅜". Calculating the moments of inertia of these three parts about the axis AB by the usual methods and adding the results, we find as the moment of inertia of the entire section

$$I = 0.524 \text{ in.}^4$$

Likewise $\quad A = 5.224 \text{ in.}^2$

Therefore

$$k = \sqrt{\frac{I}{A}} = 0.3167 \text{ in., and } \frac{l}{k} = 227.3$$

Substituting these values in the above strut formula, the breaking load is found to be

$$P = 1610 \text{ lbs.}$$

Since the load carried by the strut CH has been determined as 151 lbs., the assumed size would give a factor of safety of

$$\frac{1610}{151} = 10.6$$

and may therefore be considered as sufficiently large.

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* See "Flying," Jan., 1918.

For the strut BG, however, it will be necessary to assume a thicker section, say 1⅜" or 1½".

Size of Spars

The front upper spar only will be considered, as the same method applies to all the spars.

The simplest method is to assume a size for the spar and determine whether or not the corresponding factor of safety is sufficiently large.

Let the assumed dimensions of the cross section of the spar be as indicated on Figure 12. The top flange of the I is usually inclined in order to conform to the slope of the top surface of the wing, but as this shape complicates the calculations, it is sufficient for purposes of illustration to assume it rectangular, as shown.

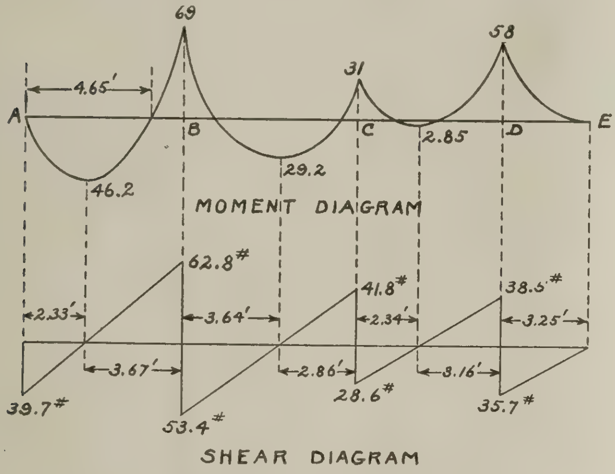


Figure 13. Moment and shear diagrams for front upper spar

For this section the neutral axis is the horizontal axis of symmetry, and the moment of inertia with respect to this axis is found by the usual methods to be

$$I = 4.80 \text{ in.}^4$$

giving a section modulus Z of

$$Z = \frac{I}{C} = 3.2 \text{ in.}^3$$

The maximum stress in the spar is due to combined bending and compression, and is given by the relation

$$\text{Unit stress} = \frac{\text{Bending moment}}{\text{Section modulus}} + \frac{\text{Compressive load}}{\text{Area.}}$$

This maximum stress will evidently occur just to the left of the point B where the compressive load and the bending moment are both greatest. Substituting the values found above, we have therefore

$$\text{Max. stress} = \frac{69 \times 12}{3.2} + \frac{736}{4.72} = 415 \text{ lbs. per sq. in.}$$

Since the ultimate compressive strength of spruce is 6,500 lbs. per sq. in. this gives a factor of safety of $\frac{6500}{415} = 15.6$

This method of computing the total stress in the spar is based on computing the direct compressive stress as for a short block instead of using a strut formula. To investigate the effect of this assumption, a more rigorous analysis will be given.

In Figure 13 are shown the bending moment and shear diagrams for the front upper spar. The points where the moment diagram crosses the axis determine the so-called "free lengths" of the spar, and each free length may be regarded as an independent strut. Thus in the first panel AB, the free length is 4.65 ft., etc.

Now let L denote the actual compressive load carried by this free length, considered as a strut, in the present case 736 lbs., and let P denote the breaking load for the same strut of this length. Since the transverse load causes the member to deflect somewhat, the direct compression acting with a lever arm equal to this deflection produces an additional moment which must be added to the transverse moment. It can be shown that the maximum moment produced by the combination of these loadings is given by the expression

$$M_{max} = \frac{M}{1 - \frac{L}{P}},$$

where M denotes the moment due to the transverse load at the center of the free length considered, and L/P is the ratio of the actual load to the breaking load for the strut. In the present case

$$M = 46.2 \text{ lbs.}$$
$$L = 736 \text{ lbs.}$$
$$P = 18{,}520 \text{ lbs.}$$

Consequently

$$M = \frac{46.2}{1 - 0.04} = 48.1 \text{ ft. lbs.}$$

This free length is therefore not as severely strained as the short portion just to the left of the point B, previously calculated, and therefore we need proceed no further. In general, however, this method of combining direct compression and bending stresses is the one that should be used.

Drift Stresses

In addition to the lift stresses produced by supporting the loaded weight of the machine in the air, there are also so-called drift stresses, due to the head resistance, or drift, in the direction of motion. The amount of the drift resistance, depends, of course, on the speed. It is necessary for an aeroplane to acquire a certain minimum horizontal speed before it can rise from the ground, and consequently there is a lower limit to the ratio of drift/lift, that is, the ratio of the total head resistance to the loaded weight of the machine, say R/W.

If V denotes the speed corresponding to the resistance R, then the gliding angle α at this speed V is given by

$$\sin \alpha = \frac{R}{W}$$

where α is the angle made by the direction of glide with the horizontal. In other words, if the aeroplane is "coasting" with the motor cut out, the component of the weight in the direction of motion, namely W sin α, must equal the total head resistance R.

For a biplane it has been found by experiment that the minimum values of the ratio R/W lie between .14 and .23. The gliding angles corresponding to these values for sin α are about 8° and 13° respectively.

The maximum speed of an aeroplane, and consequently the maximum head resistance, is, of course, limited by the power of the motor. Assume that the biplane under consideration is powered with a 125 H.P. motor and attains a maximum speed of 60 miles per hour. Since

$$\text{Head resistance} \times \text{speed} = \text{power} \times \text{efficiency},$$

assuming an overall efficiency for motor and propellor of 60 per cent, we have

$$R \times 88 = 125 \times 550 \times .60$$

whence

$$R = 470 \text{ lbs.}$$

About one-third of this resistance is due to the fuselage, leaving two-thirds, or 315 lbs., to be carried by the planes. Since the total span of upper and lower planes together is 76.75 ft., this gives an average uniform load on the front spars of $\frac{315}{76.75}$ = 4.1 lbs. per linear foot. In order to carry this load the spars are braced by wire diagonals, forming with the ribs what is known as a drift truss. The effect of this drift loading on the spars is to produce tension in the front spar and compression in the rear spar, increasing from zero at the outer end to a maximum in the panel adjoining the fuselage where the moment is greatest. In the present case, since the length of the front spar is 21¼ ft., by treating the drift truss like a cantilever beam, the maximum moment in it adjoining the fuselage panel is found to be

$$M = \frac{4.1\ (21\tfrac{1}{4})^2}{2} = 925.7 \text{ ft. lbs.}$$

Equating this to the moment of resistance of the spars, namely the load in one spar times the distance between them, we have

$$\text{Max. tension in front spar} = \frac{925.7}{3.33} = 278 \text{ lbs.}$$

Since the area of the spar is 4.72 sq. in., we have therefore

$$\text{Max. tensional stress in front spar} = \frac{278}{4.72} = 60 \text{ lbs. per sq. in.}$$

The effect of this tensional stress is to reduce the compressive stress in the front spar, and consequently it is not necessary to consider the drift stresses in this spar further. In computing the total stress in the rear spars, however, the drift stresses must be taken into account.

THE ALBATROS TYPE "CV" FIGHTER

(*Continued from page* 450)

IN addition to the general construction drawings of the albatros wings, shown in a previous illustration, we are able to give some of the more interesting constructional details. Fig. 26 shows some details of the upper left-hand wing near the tip, and also the general arrangement of one of the ailerons. As will be gathered from the sketch at the left top of Fig. 26, the wing flaps are built up of steel tubing throughout, and each aileron is balanced by a forward projection, not, as in the Gothas, outside the tip of the main wing, but working in an opening in the main plane. As in nearly all German machines, the aileron is not hinged to the rear main spar, but to a third false spar situated between the rear main spar and the trailing edge. The method of hinging the aileron will be clear from the detail section and elevation at A. A. steel clip is bent over the tube of the aileron and has its forward ends bent into grooves in wood blocks on the front face of the spar, much in the same manner as was employed in the case of the elevator hinge and described when dealing with that member. As in the case of the elevator hinge the fabric covering of the wing flaps is attached to wood blocks screwed to the tube.

The crank lever for operating the wing flap is in the form of an elliptical section tube tapering towards its ends. Each half of this crank lever carries three wiring clips, as shown at B. It will be seen that by providing three clips on each end instead of one, a means for varying the gearing of the wing flap control is furnished. If a pilot wishes the machine to be fairly sensitive on the lateral control he will naturally attach his wing flap cables to the inner clips, since thereby a movement of the control lever will result in a larger movement of the wing flap. On the other hand, if he prefers to have a large movement on his control lever without too great corresponding angularity of his wing flaps or ailerons, he will attach his cables to the outer clips, as this will result in a "gearing down" of the wing flap.

The forward end of the wing flap crank lever works in a slot between two closely spaced ribs, as shown in the sketches. At this point the ribs are strengthened by making them of the box type for their rear portion, and the ash flanges of the ribs are left wider over this portion, while being reduced to their normal width from the rear spar forwards, as indicated in the sketch. At this point also occurs the strut and lift cable attachment. This strut being the last, there is only one cable instead of the two occurring where the inner struts are attached, otherwise the attachment is similar in principle to that illustrated recently in Aerial Age. The spar box and strut and cable attachment is indicated in the detail sketch at C. The tubular compression strut is secured in the same manner as that of the fitting previously referred to.

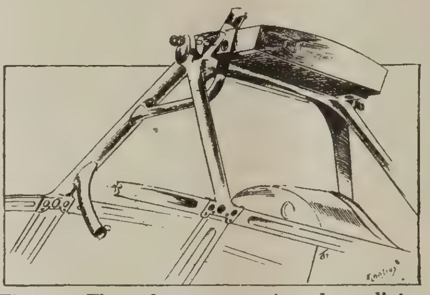


Fig. 27—The cabane supporting the radiator and upper plane of the Albatros biplane. Note the manner of carrying the water tube through one of the cabane legs

As previously pointed out, the trailing edge of the Albatros wings is in the form of a wire, and the method whereby the outer main rib is prevented from bending sideways is illustrated in the detail sketches at D and E. In addition to the wire forming the trailing edge, there is another wire running parallel to it and carried right through the wings, the object of which appears to be to provide a counterpoise capacity. The wiring in the Albatros is not extensive, and in the case of the fuselage it is absent altogether, and it therefore appears probable that the thin cables running along the wings and the longerons of the fuselage serve the purpose of providing the necessary amount of wiring, otherwise one is at a loss to account for their function.

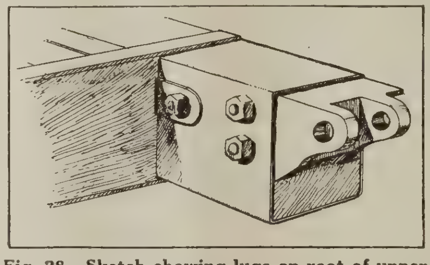


Fig. 28—Sketch showing lugs on root of upper main wing spars of the Albatros

It has always been customary for German aeroplane designers to provide some easy means for quickly detaching the wings from the body, and the present Albatros is no exception from the rule in this respect. The cables themselves are not, it is true, fitted with the quick release devices one finds on the L.V.G., for instance, but the spar attachment has been designed to facilitate the removal of the wing, even if that of the cables has not. In Fig. 25 is shown the spar box and its attachment of the lower wing. A sheet steel box surrounds the root of the spar, and has in its end a slot into which fits the lug secured to the side of the body. This spar box is ribbed internally as shown in the sketches, and the spar itself has in its end saw cuts accommodating these ribs.

Welded to the side of the spar box is a socket forming a bayonet joint, into which fits a pin fitted with a small spiral spring. The spar is held against the side of the body with the lug projecting into the spar box, and the pin is inserted and given a twist so as to bring the projections on the pin into the notches in the bayonet joint, and the spar is secured. For removing the wing all that has to be done is to press the pin slightly against the action of the spiral spring, give it a twist and pull it out of its socket, and the spar can be withdrawn. The spar is secured to the spar box by screws, and the box is further secured against tensional loads by a steel strip about a foot long running along the face of the spar and anchored at its other end by a bolt passing horizontally through the spar.

As the lower wing spars are subject, in addition to the bending moment owing to the lateral load on them, to tension, the attachment to the body has to be such that it will resist a tensional load as well. The method of doing this is shown in the right-hand sketches in Fig. 25. The lug to which the spar is attached fits into a recess in the base plate formed by stamping. The axial pull is transmitted across the bottom of the fuselage via the brackets and strips shown, which are bolted to the base plate holding the lug. In order to prevent the lug from turning it is riveted by four rivets as indicated.

The upper planes are attached, as in nearly all German machines, to a four-legged cabane. In addition to supporting the wings the cabane of the Albatros carries the radiator, which is of the same shape as the wing section and which fits into an opening in the wing. The cabane is shown in Fig. 27. It will be seen that one of the cabane legs carries for a short distance the water tube from the radiator to the engine.

The attachment of the upper wing spars to the cabane is somewhat similar to that of the lower spars, inasmuch as a pin fitted with a spiral spring secures the spar to the cabane. Here, however, the similarity ceases. Instead of the spar box into which fits the lug on the

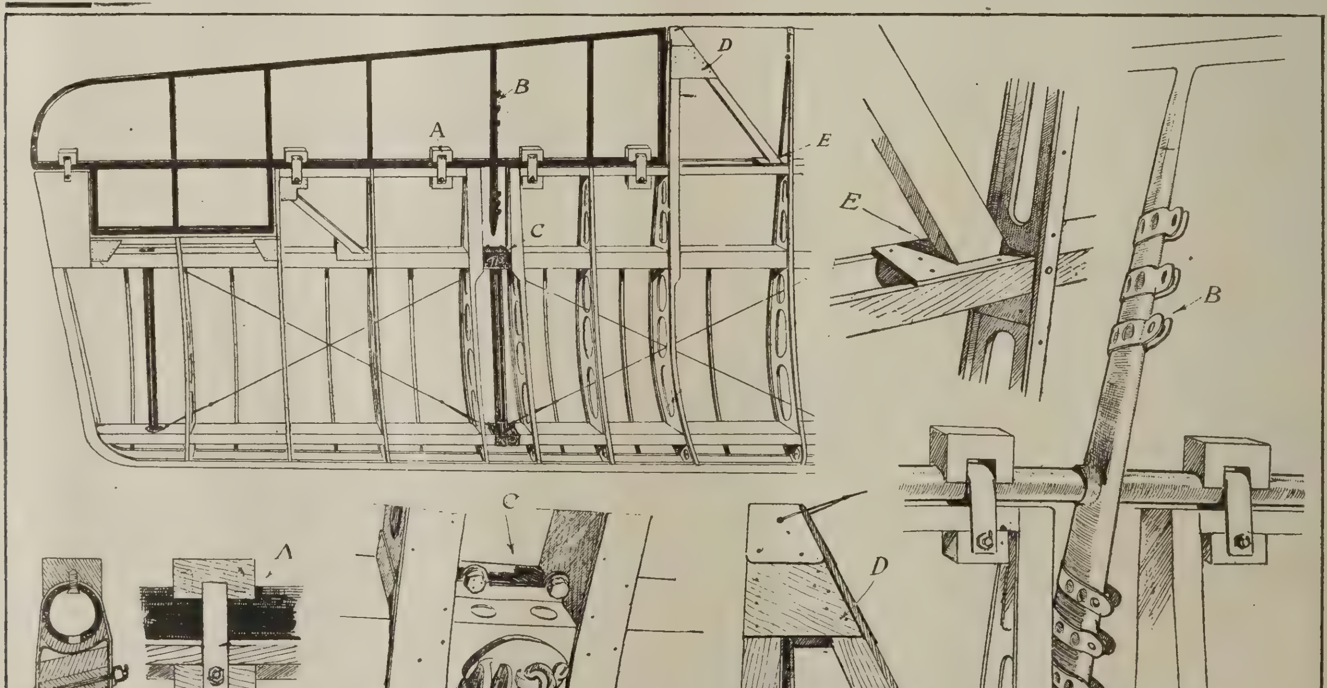


Fig. 26—The wing flap and some wing details of the Albatros fighting biplane

The chassis of the Albatros C-V type

side of the body, the upper spars are provided with a forked lug, probably a forging machined to shape, of the form shown in Fig. 28. The lug of the opposite spar is of the same shape, but is, of course, reversed, so that when the two spars meet against the top of the cabane, their respective lugs are staggered in relation to one another. From the shape and attachment of the lugs it will be seen that as they are staggered on the spar and in relation to one another, the spars will, when in place, come in line with one another. On one of the outer faces of the forked lug a piece is left solid, and is shaped to receive the rounded end of the opposite lug. This has probably been done in order to reduce the shearing stress on the pin securing the lugs to the cabane.

In a previous issue reference was made to the lateral control of the Albatros, the chief feature of which was, it may be remembered, that the wing-flap crank-lever was horizontal, as in so many other German machines. The control cables for the wing-flaps are, therefore, arranged in a somewhat unusual way. The details of this arrangement are shown clearly in Fig. 30. From the front and rear half of the wing-flap crank-lever cables pass down to pulleys enclosed in a casing mounted on the rear face of the back spar of the lower plane. After passing over these pulleys the control cables pass *through* the rear spar to another pair of pulleys mounted on the tubular compression strut, and hence to the controls in the body. A light framework surrounds the pulleys as shown in the sketch, and forms the support for the hinged inspection doors by means of which the condition of the pulleys and control cables may be examined. The tension of the wing-flap control cables is regulated by means of turnbuckles inside the lower wing. These turnbuckles are situated close to the side of the body, and are rendered accessible by hinged aluminium inspection doors on the lower surface of the bottom wing. In order to prevent the turnbuckles from catching against the edges of the wing ribs, cables and turnbuckles are surrounded by a tube of aluminium, having on its under side an opening with edges flanged outwards to reduce the danger of a slack control cable allowing the turnbuckle to touch the edges of the opening in the tube.

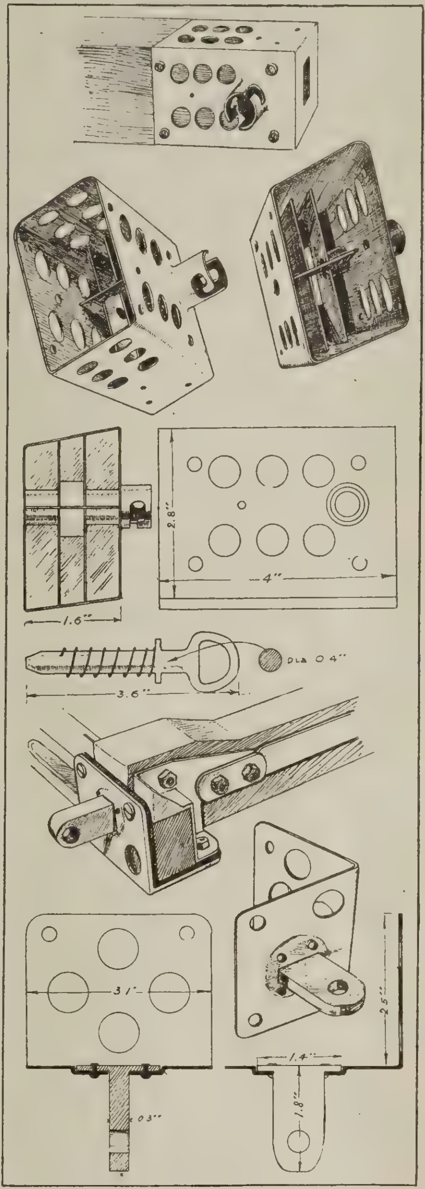


Fig. 25—The spar box and its attachment to the fuselage of the Albatros fighting biplane

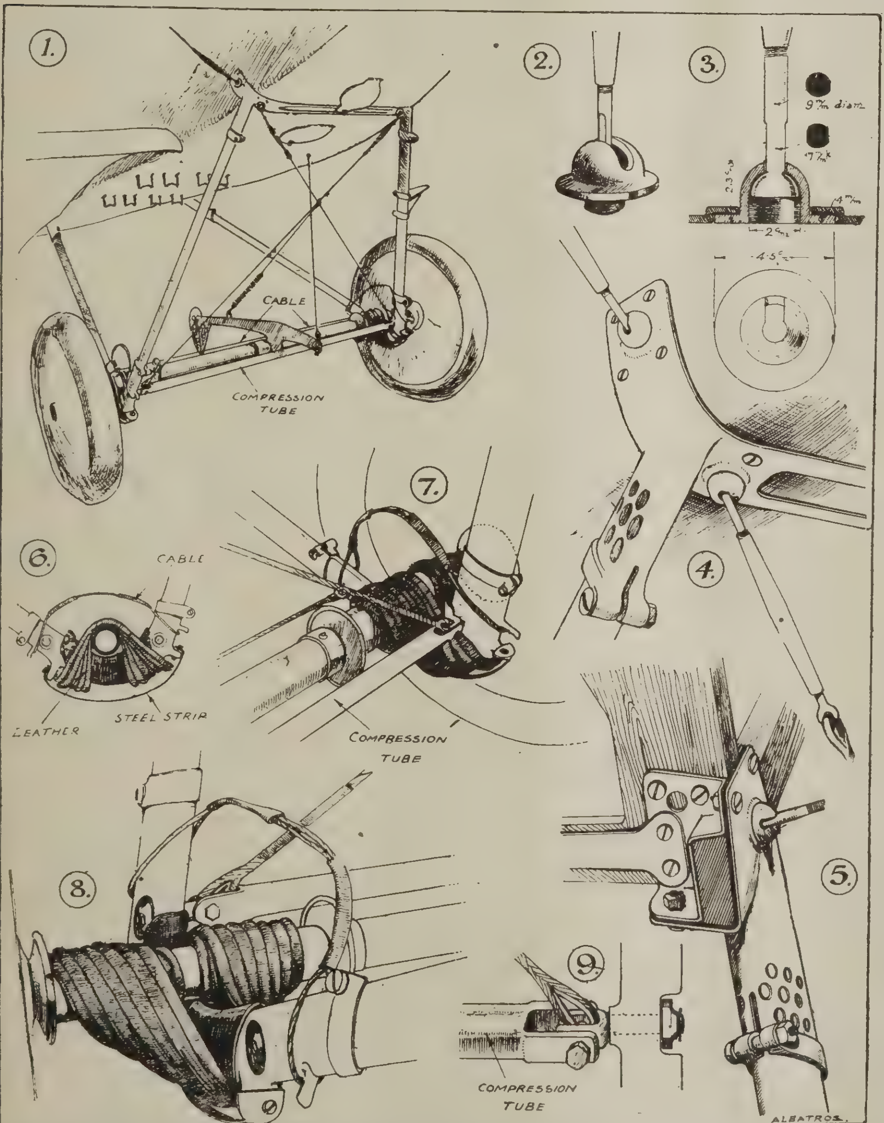


Fig. 29—Some details of the undercarriage of the Albatros. 1. General arrangment of the undercarriage. 2 and 3. Detail of cable terminal. 4. Steel strip passing under body, to which is welded the front chassis strut socket. 5. Attachment of rear chassis strut to body. 6. Lower attachment of chassis struts and shock absorbers. 7, 8 and 9. Details of same

As in the majority of modern tractor aeroplanes, the undercarriage of the Albatros is of the Cee type, and is built of stream-line steel tubing throughout. The general arrangement of the undercarriage is shown in I, Fig. 29, from which it will be seen that only the front pair of undercarriage struts are diagonally braced by cables. Reference has already been made to the claw brake, and to the manner in which it is operated from the pilot's cockpit. In the sketch its general arrangement will be evident. The front and rear struts of the undercarriage fit into split sockets at the top and bottom respectively, from which they may be withdrawn by undoing the bolts of the socket, thus facilitating replacement in case of damage due to a rough landing.

Front and rear strut sockets are attached to the body in a slightly different manner, as will be seen from the sketches of Fig. 29. In the case of the front strut sockets these are welded to a wide steel strip passing underneath the bottom of the body, thus tending to distribute the load over a greater area of the body. The details are shown in the general arrangement sketch, and in 4, Fig. 29. Just inside the strut socket the cup-shaped terminal for the diagonal bracing cables of the undercarriage is secured, while a short distance above the socket is situated the attachment for one of the main lift cables. This ball and socket joint, which is used with slight variations on nearly all German machines, appears to be almost the only fitting that may be truly said to have been standardized by the Germans. It is made in a range of sizes, no doubt all made to some uniform standard, so as to render it applicable to a number of different types of machines. The details of the fitting are indicated in 2 and 3, Fig. 29. The base plate securing the hemispherical socket to the body or whichever part of the aeroplane the terminal happens to be attached to, is recessed, probably by stamping, and into this recess fits the flange of the socket. The socket itself is free to turn in the circular recess of the base plate, thus allowing the cable to accommodate itself to any angle desired. The end of the turnbuckle has two flats on its shank which prevent the strainer from turning. For purposes of adjustment the slot in the socket is enlarged at its inner end so as to allow the strainer to turn when in a position at right-angles to the base plate.

The attachment of the rear chassis strut to the body is shown in 5, Fig. 29. The base plate to which the strut socket is welded is of angle section, and is secured, *via* brackets as shown, to steel strips running across the body, and which take the tension of the lift cables. This arrangement is somewhat similar to that of the lower wing spar attachment, which we described in a recent issue.

The lower ends of the two Vees are formed by short lengths of bent tube of slightly larger dimensions than the struts themselves, for which they form sockets. The details will be evident from the sketches and hardly need any explanation. Running across the undercarriage parallel with the axle are; in front a compression tube, and behind a stranded cable.

A steel strip protects the rubber shock absorbers from contact with the ground, and a padding of leather is interposed between the axle and the bottom of the Vee. The upward travel of the wheel axle is limited by a short loop of cable, against which the axle comes to rest after travelling the permissible amount.

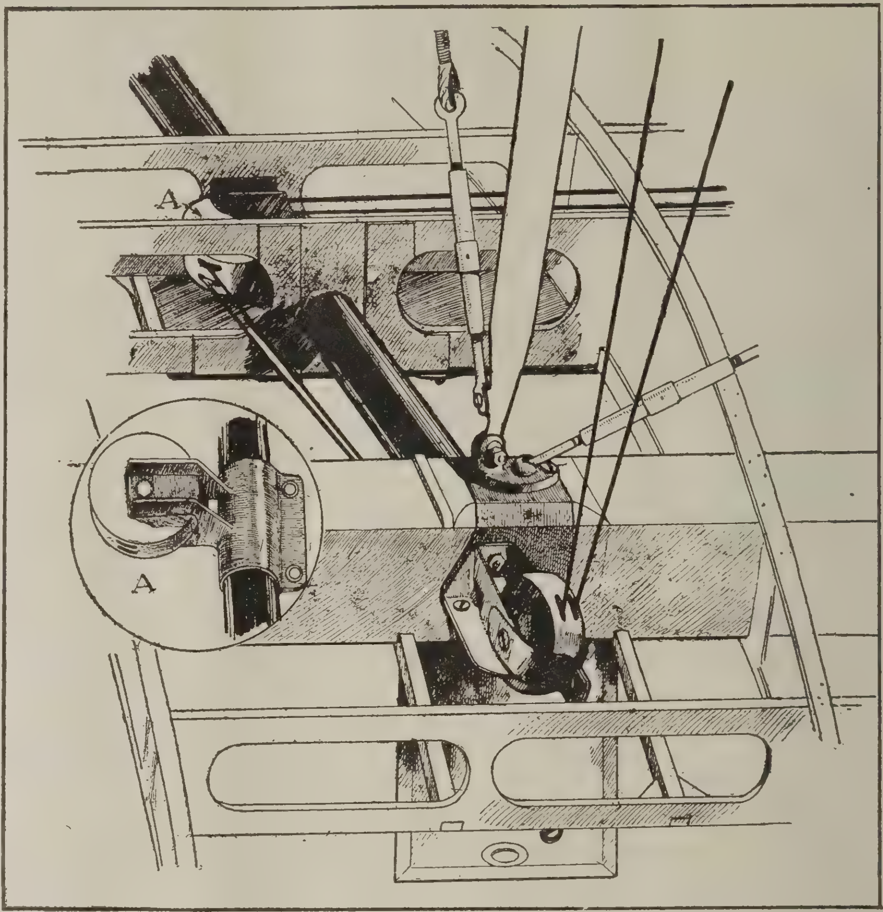


Fig. 30—Arrangement of wing flap control cable pulleys in bottom wing of the Albatros. After passing over pulleys on rear spar, the control cables pass through the spar horizontally

DETAILS OF LIBERTY MOTOR REVEALED IN OFFICIAL STATEMENT BY WAR DEPARTMENT

THE War Department on May 15 issued its first authorized statement regarding details of construction of the Liberty motor. It discloses that the Liberty motor was a combination of many motors. The statement reads:

"The designs of the parts of the Liberty engine were based on the following:

"Cylinder.—The designers of the cylinders for the Liberty engine followed the practice used in the German Mercedes, English Rolls Royce, French Lorraine Dietrich, and Italian Isotta Frachini before the war and during the war. The cylinders are made of steel inner shells, surrounded by pressed steel water jackets. The Packard Company by long experiment had developed a method of applying these steel water jackets. The valve cages are drop forgings welded into the cylinder heads. The principal departure from European practice is in the location of the hold-down flange, which is several inches above the mouth of the cylinder, and the unique method of manufacture evolved by the Ford Company. The output is now approximately seventeen hundred cylinder forgings per day.

"Cam Shaft and Valve Mechanism Above Cylinder Heads.—The design of the above is based on the Mercedes, but was improved for automatic lubrication, without wasting oil, by the Packard Motor Car Company.

"Cam Shaft Drive.—The cam shaft drive was copied almost entirely from the Hall-Scott motor; in fact, several of the gears used in the first sample engines were supplied by the Hall-Scott Motor Car Company. This type of drive is used by Mercedes, Hispano-Suiza, and others.

Angle of Forty-five Degrees

"Angle Between Cylinders.—In the Liberty engine, the included angle between the cylinders is forty-five degrees; in all other existing twelve-cylinder engines it is sixty degrees. This feature is new with the Liberty engine, and was adopted for the purpose of bringing each row of cylinders nearer the vertical and closer together, so as to save width and head resistance. By the narrow angle greater strength is given to the crank case and vibration is reduced.

"Electric Generator and Ignition.—A Delco ignition system is used. It was especially designed for the Liberty engine, to save weight and to meet the special conditions due to firing twelve cylinders, with an included angle of forty-five degrees.

"Pistons.—The pistons of the Liberty engines are of Hall-Scott design.

"Connecting Rods.—Forked or straddle type connecting rods, first used on the French De Dion car and on the Cadillac motor car in this country, are used.

"Crank Shaft.—Crank shaft design followed the standard twelve-cylinder practice, except as to oiling. Crank case follows standard practice. The forty-five degree angle and the flange location on the cylinders made possible a very strong box section.

"Lubrication.—The first system of lubrication followed the German practice of using one pump to keep the crank case empty, delivering into an outside reservoir, and another pump to force oil under pressure to the main crank-shaft bearings. This lubrication system also followed the German practice in allowing the overflow in the main bearings to travel out the face of the crank cheeks to a scupper, which collected this excess of crank-pin lubrication. This is very economical in the use of oil and is still the standard German practice.

"The present system is similar to the first practice, except that the oil, while under pressure, is not only fed to main bearings, but through holes inside of crank cheeks to crank pins, instead of feeding these crank pins through scuppers. The difference between the two oiling systems consists of carrying oil for the crank pins through a hole inside the crank cheek, instead of up the outside face of the crank cheek.

"Propeller Hub.—The Hall-Scott propeller hub design was adapted to the power of the Liberty engine.

"Water Pump.—The Packard type of water pump was adapted to the Liberty.

"Carbureter.—A carbureter was developed by the Zenith company for the Liberty engine.

"Bore and Stroke.—The bore and stroke of the Liberty engine is 5x7 inches, the same as the Hall-Scott A-5 and A-7 engines, and as in the Hall-Scott twelve-cylinder engine.

Development of the Engine

"Remarks.—The idea of developing Liberty engines of four, six, eight, and twelve cylinders with the above characteristics was first thought of about May 25, 1917. The idea was developed in conference with representatives of the British and French missions, May 28 to June 1, and was submitted in the form of sketches at a joint meeting of the Aircraft (Production) Board and the joint Army and Navy Technical Board June 4. The first sample was an eight-cylinder model, delivered to the Bureau of Standards, July 3, 1917. The eight-cylinder model, however, was never put into production, as advices from France indicated that demands for increased power would make the eight-cylinder model obsolete before it could be produced.

"Work was then concentrated on the twelve-cylinder engine, and one of the experimental engines passed the fifty-hour test Aug. 25, 1917.

"After the preliminary drawings were made, engineers from the leading engine builders were brought to the Bureau of Standards, where they inspected the new designs and made suggestions, most of which were incorporated in the final design. At the same time expert production men were making suggestions that would facilitate production.

"The Liberty twelve-cylinder engine passed the fifty-hour test, showing, as the official report of Aug. 25, 1917, records, 'that the fundamental construction is such that very satisfactory service, with a long life and a high order of efficiency, will be given by this power plant, and that the design has passed from the experimental stage into the field of proven engines.'

"An engine committee was organized informally, consisting of engineers and production managers of the Packard, Ford, Cadillac, Lincoln, Marmon, and Trego companies. This committee met at frequent intervals, and it is to this group of men that the final development of the Liberty engine is largely due."

THE SOPWITH TRIPLANE*

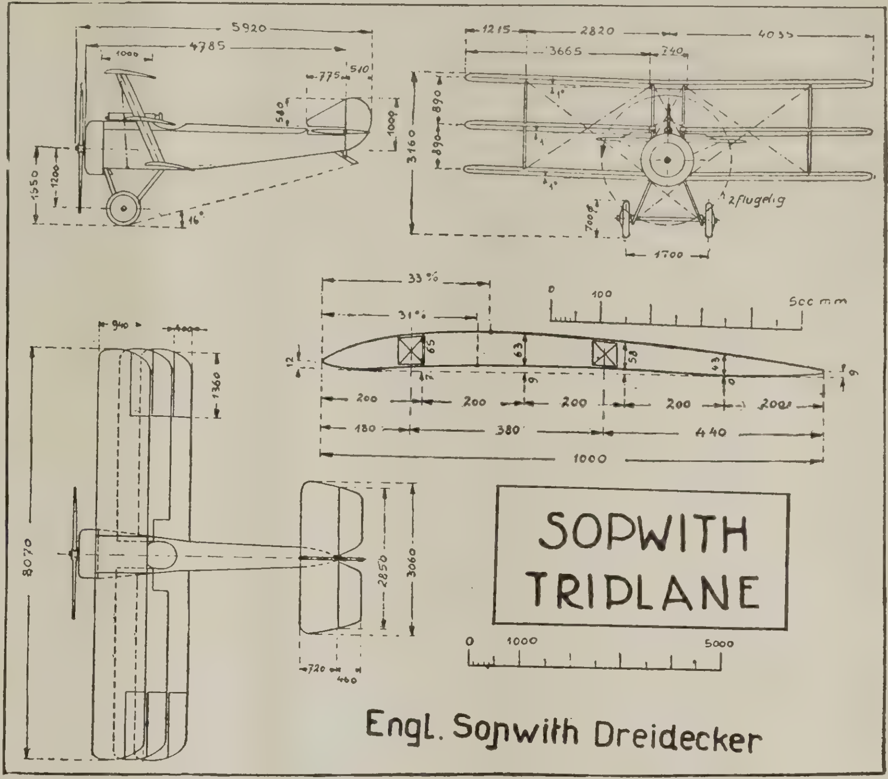
IN *Deutsche Luftfahrer Zeitschrift* of August 22, 1917, Dipl. Ing. Roland Eisenlohr gives the following description of the Sopwith triplane:†

Among the new types of aeroplanes which the war has brought into being, the Sopwith occupies a unique position, as being the first triplane to be put into practical use. After some not very successful experiments in the earlier days of aviation, carried out in Germany by Hans Grade in 1907; in England by A. V. Roe, and in France by Goupy, this form of construction had fallen into disuse, and no great future prospects were anticipated for this type of machine.

What probably has led to the return of this form of construction is probably the small span which it enables one to use. Another advantage of the triplane arrangement is that the aspect ratio, which should not be less than 6, but which in many machines of short span often has to be considerably less, can be more easily arranged for in the triplane. Thus in the case of the Sopwith triplane the chord is only little over 1 metre, and the span is 8 metres. The increased wing resistance is counteracted by the employment of only one strut on each side and a very simple wing bracing. Furthermore it is possible, owing to the light loading of the wings, to construct the wing spars considerably lighter, and still have a comparatively great free length of spar, in the case of the Sopwith triplanes about 2.75 m. with an overhang of 1.40 m. The weight of the total wing area will therefore scarcely come out greater than in the case of a biplane of the same area. Possibly also the arrangement of the wings is advantageous as regards the view obtained by the pilot, as the middle wing is about on a level with his eyes, and the upper and lower wings, on account of their small chord, do not obstruct the view to as great an extent as the wings of the ordinary smaller biplane having a greater wing chord. While both lift wires pass in front of the middle wing, the landing wire runs through it. The bracing cables for the body struts are crossed in the case of those running forward to the nose of the machine, while those bracing the struts in a rearward direction are straight. The gap between the wings is 90 centimetres, and the stagger is about 25 per cent. All the wings are fitted with wing flaps connected by a vertical steel band. In the nose the body carries a 110 h.p. Clerget rotary motor, enclosed in a circular cowl, which projects below the body in order to allow the air to escape.

The body is of rectangular section, rounded off in front by means of a light wooden framework in order to make it merge into the curve of the engine cowl. The width of the fuselage is 0.70 m., and it tapers to a vertical knife-edge at the back, to which the rudder is hinged. The elevator is in two parts, and has in front of it a tail plane of about 3 metre span, which, as in all Sopwith machines, can have its angle of incidence adjusted during flight.

The area of the Sopwith triplane is 27 square metres, so that for a total weight of 670 kilogs. the wing loading is only 25 kilogs. per square metre. With such a light loading the machine has undoubtedly a considerable speed and a very good climb. Further particulars relating to these have yet been published up to the present.



Engl. Sopwith Dreidecker

The triplane is built both as a single-seater and as a two-seater, and has always a fixed machine gun in front above the fuselage, and in the case of the two-seater another machine-gun operated by the observer. This increases the weight of the two-seater by about 100 kilogs.

The under-carriage consists, as in all Sopwith machines, of two V's of steel tubing and a divided wheel axle, the hinge of which is braced from the fuselage.

The following remarks are taken from the *Flugsport:*

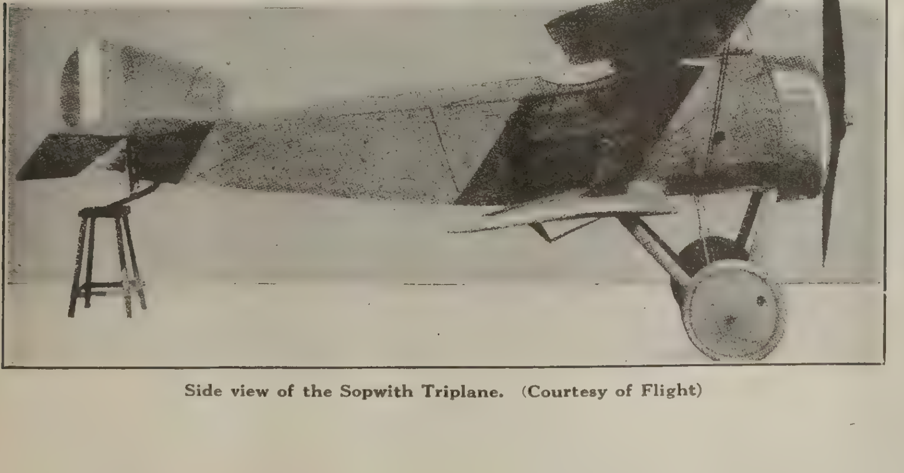
The fuselage with tail plane and rudder is the same as that of the small Sopwith single-seater biplanes. The three wings have a span of 8.07 m. and a chord of 1 m. The lower and middle wings are attached to short wing sections on the fuselage. The upper plane is mounted on a canopy (the German term for a small center section supported by struts from the body—Ed.). Both spars of the upper wing are left solid, while those of the lower and middle are of I-section. The interplane struts, which are of spruce, and of streamline section, run from the upper to the lower wing, and the inner ones from the upper wing to the bottom rail of the fuselage. In order to give a better view the middle wing, which is on a level with the pilot's eyes, is cut away near the fuselage.

The wing bracing is in the from of streamline wires of ¼-in. diameter. The very simply arranged landing wires are in the plane of the struts, while the bracing of the body struts, as well as the duplicate lift wires, are taken further forward. From the rear spar of the middle wing, wires are run forward and rearward to the upper rail of the fuselage, and the lower wing also has a wire running forward to the lower rail of the body. All the planes have wing flaps, and inspection windows of celluloid are fitted over the pulleys for the wing flap cables.

The motor is a 110 h.p. Clerget, and the petrol is led to the engine by means of a small propeller air pump mounted on the righ hand body strut. As the air screw was not in place we cannot give details of it. In the pilot's seat were the following instruments:—On the righ a hand wheel for varying the angle of incidence of the tail planes, a hand operated air pump and a petrol indicator. In the middle, air speed indicator, manometer, clock, revs. indicator, and switch. On the left a petrol tap, lever for regulating the air, and lever for regulating the petrol. The weight of the machine empty was found to be 490 kilogs., and if the useful load is assumed to be 200 kilogs., we obtain a total weight of 690 kilogs., which, with an area of 21.96 sq. metres, would give a loading of 31.4 kilogs. per square metre.

Further, the following particulars are given: Motor: Clerget, nominal h.p. 110, brake h.p. 118; fuel capacity for two hours, petrol 85 litres, oil 23 litres; area of wings and flaps (square metres), upper 7.90, middle 6.96, lower 7.10, total 2196; area of elevators 6 by .5, of wing flaps 1.10, of rudder .41. Angle of incidence (degrees): upper wing, root + 1, tip — .8; middle root + 1.5, tip + 1.5; lower, root + .5, tip —.5; tail plane, variable + 2 to — 2 degrees. Loading per. sq. metre, empty 22.3, fully loaded 31.4; loading per brake h.p. empty 4.15, fully loaded 5.85.

	Weights in kilograms.
Fuselage with under-carriage and accessories	123.5
Wings	135
Tail plane, rudder and elevator	13
Engine	160
Petrol tank	15
Oil tank	8.5
Propeller	16
Engine accessories	16
Mounting	3
Total weight empty	490
Pilot	80
Gun and ammunition	40
85 litres of petrol and 23 litres of oil	80
Total weight, useful load	200



Side view of the Sopwith Triplane. (Courtesy of Flight)

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*These particulars of the Sopwith triplane are translated from German aeronautical journals, and the accuracy of the data given, cannot, of course, be vouched for nor, for obvious reasons, can mistakes be pointed out that may be present. In spite of this, however, these particulars are of sufficient interest to be included in our series of descriptive articles on aeroplanes.—Courtesy of *Flight.*)

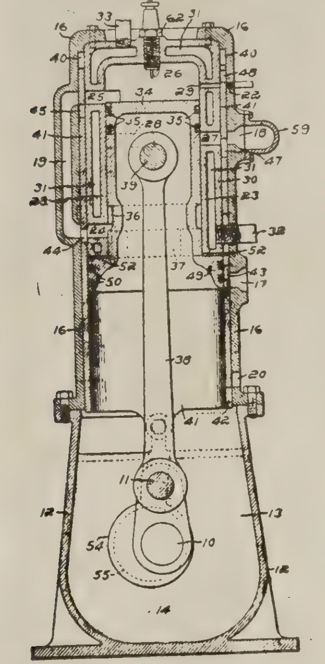
† See also description of Sopwith in AERIAL AGE, October 15, 1917 and November 26, 1917.

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,260,297. INTERNAL-COMBUSTION ENGINE. George L. Badger, Quincy, Mass. Filed October 1, 1913. Serial No. 792,871. (Cl. 123—71.)

In an internal combustion engine, the combination of an outer cylinder, an inner power cylinder separated from said outer cylinder by an annular space, a tubular valve encircling said power cylinder, and a piston having two diameters the smaller working in the bore of said power cylinder and the larger working within said valve.



In an internal combustion engine, the combination of an inner power cylinder having an inlet and a transfer port, an outer cylinder having an inlet port and a transfer passage the latter adapted to communicate with said ports in the power cylinder, and a slide valve intermediate said cylinders for controlling said ports.

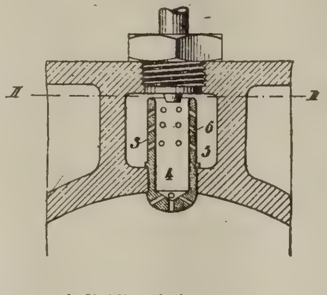
In a two cycle internal combustion engine, the combination of an outer cylinder provided with inlet, exhaust and transfer ports, an inner power cylinder provided with inlet, exhaust and transfer ports, a piston working in said power cylinder and provided with an enlarged portion at its lower or inner end forming a compression piston, and a slide valve intermediate said cylinders for controlling said ports, the smaller part of said piston being provided with a recess arranged to register with said transfer ports when the piston approaches the end of its exhaust stroke.

In a multi-cylinder two cylce engine, the combination of a closed crank-case provided with a plurality of separate compartments corresponding to the cylinders, and a plurality of cylinder units each comprising an outer cylinder secured to said crank-case and provided with a scavenging passage opening at one end into an adjacent compartment of the crank-case, an inner power cylinder supported by said outer cylinder and provided with a port adapted to communicate with the other end of said scavenging passage, and a slide valve intermediate said cylinders for controlling said port.

In an internal combustion engine, the combination of a plurality of cylinders provided with inlet and exhaust ports, pistons working in said cylinders in paired relation to each other, and an exhaust manifold connected to said cylinders, said manifold being divided into separate chambers, one pair of cylinders exhausting into one chamber and the other pair exhausting into the other chamber, the respective cylinders of one pair exhausting alternately with relation to the respective cylinders of the other pair, said manifold having a conduit leading from one of said chambers through the other.

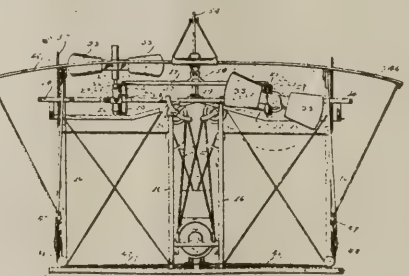
1,260,408. INTERNAL-COMBUSTION ENGINE. Harry Ferdinand Leissner, Ljusne, Sweden. Filed July 16, 1917. Serial No. 180,925. (Cl. 123—30.)

In an internal combustion engine, the combination of a combustion chamber, a primary explosion chamber, a sleeve in permanent communication with the former and extending into the latter and dividing it into two compartments, one outside and one inside said sleeve, the sleeve being provided with apertures which extend obliquely through its wall and connect the said compartments, whereby gas mixture passing through said apertures is caused to perform a rotary movement in the compartment into which it is discharged, and a fuel nozzle opening into the compartment inside the sleeve.



1,260,917. AEROPLANE. Franklin William Lake, Kingston, Ontario, Canada. Filed Mar. 19, 1917. Serial No. 155,828. (Cl. 244—15.)

In an aeroplane, a framework, a plurality of propellers mounted on said framework to be turned in a vertical, horizontal or intermediate angle position, means for operating said propellers, and means operated from the main drive wheel for assisting in the turning of said propellers from a horizontal to a perpendicular position.

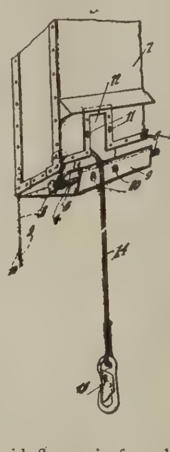


In an aeroplane, a framework, propellers mounted to be turned in a vertical, horizontal or intermediate angle position irrespective of each other, means whereby in making a sharp turn the outside propeller will pull forward and the inside propeller pull upward, and additional means operable from the main drive wheel for assisting in the turning of the propellers from a horizontal to a perpendicular position.

1,260,474. PARACHUTE CASE OR ENVELOP. Frank Stevens, New York, N. Y., assignor of one-half to Julia Stevens, Niagara Falls, N. Y. Filed Sept. 12, 1917. Serial No. 190,939. (Cl. 244—21.)

In combination, an envelop, a parachute in said said envelop, ropes connected to the segments of said parachute and attached to a rigid cross bar separate from said parachute at the bottom of said envelop, and yieldable means holding said cross bar within said envelop, the hold of said yieldable means being overcome to release said bar by a downward pull thereon.

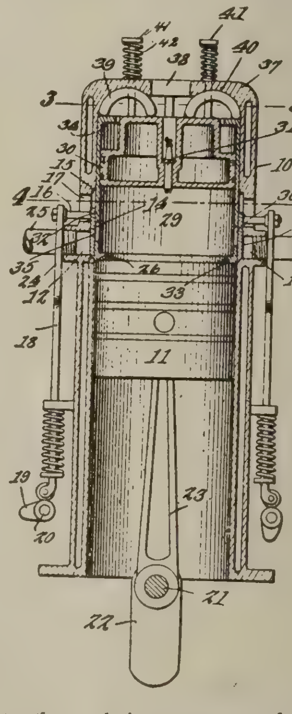
In combination, an envelop having vertical recesses at the bottom of a face thereof, said envelop having a bottom connected thereto in a hinge-like manner, the connection between said envelop and said bottom being located at the bottom of that face of said envelop opposite to the said recessed face, said bottom having a vertical flange connected thereto in a hinge-like manner, which is adjacent to said recesses when the said bottom is closed, yieldable spring means for connecting said envelope and said flange, a parachute in said envelope having ropes attached to its segments connected to a rigid cross bar located adjacent said recesses, a harness adapted to be placed around the body of the aviator, ropes connecting said harness to the said cross bar and passing through said recesses, whereby when a pull is exerted upon the said harness, the said flange is forced away from the envelop, the said bottom is opened, and the parachute withdrawn from the envelop.



A parachute container having a face with vertical recesses at the bottom thereof, a bottom connected thereto in a hinge-like manner having a vertical flange connected to said bottom in a hinge-like manner adjacent said recesses, and yieldable spring means connecting said flange to said container.

1,260,653. INTERNAL-COMBUSTION ENGINE. George H. Duke, Hotchkiss, Colo. Filed March 6, 1917. Serial No. 152,853. (Cl. 123—51.)

In an internal-combustion engine, a cylinder, a piston in the cylinder, a slidable head in the cylinder back of the piston, said head being exposed to the explosion pressure and movable thereby outward of the piston, and means engagable with the back of the piston for transmitting said movement of the head to the piston at the beginning of the firing stroke thereof in the same direction the piston moves during said stroke.



THE WIDNEY PATENT "RESILIOMETER"

That the day of standardization of all resilient materials used for mechanical Felt parts has at last arrived, was indicated recently in an interview with President Stanley W. Widney, of the Advance Felt Specialty & Cutting Company, Chicago.

Mr. Widney, after four years of investigation, research and experimental work, recently perfected an invention called the "Resiliometer," a scientifically accurate instrument designed to measure thickness, hardness and resiliency of any resilient material. Although, Mr. Widney worked on this machine with a view of making it useful to him in his own business, it soon became apparent that the scope of the "Resiliometer" would be almost universal and not confined to the testing of Felt alone.

In fact, the "Resiliometer" soon became an almost indispensable factor for setting an absolute standard of such materials as Felt, Rubber, Leather, Paper, Asbestos, packings of all kinds, cork, fabrikoids, any resilient material employed in the industrial arts.

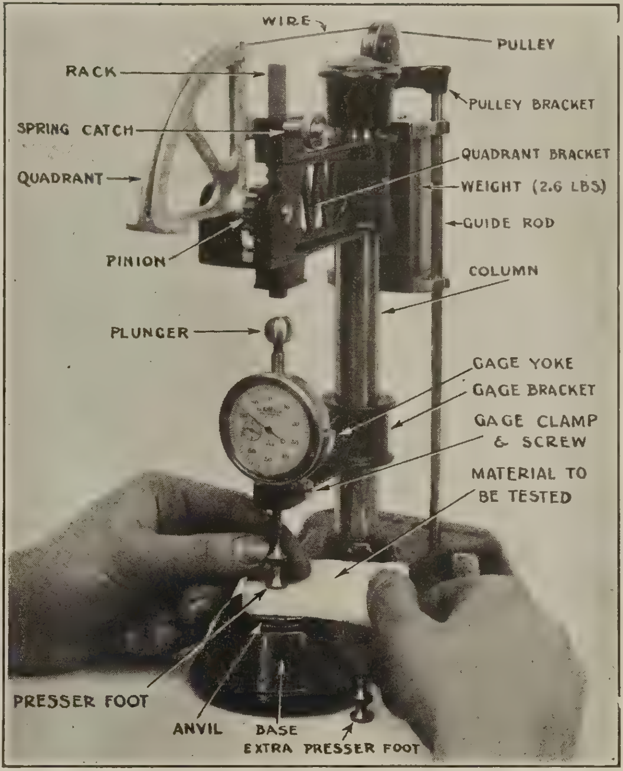
The "Resiliometer" is easy to understand and easy to operate. It consists of four simple elements. First: The anvil on which the material being tested is laid. Second: A direct-reading micrometer gauged to indicate thousandths of an inch. Third: A quadrant moving on a pinion, which carries the support for a 2.6 lb. weight. Fourth: The presser-foot which comes in contact with the material and registers directly on the dial.

Simple as the principle of the instrument is, the task of working it out has been difficult. Its operation for this very reason is reduced to the extreme of facility and simplicity; no more skill is required to obtain readings than to tell the time by the clock. A piece of resilient material is inserted between the anvil and the presser-foot. As soon as the presser-foot rests securely upon the material the hand on the dial shows the thickness is thousandths of an inch. This reading obtained, the weight at the right is released and allowed to apply pressure, without shock, upon the material. This causes the presser-foot to sink further into the material until stopped by the natural resistance or hardness.

Suppose that the original thickness registered on the micrometer dial were found to be one-tenth of an inch, then suppose that under pressure the material compresses until it is only 50-1000 thick. Then:

Original thickness	.100
Thickness under pressure	.050

Then the hardness of the material, its resistance to pressure, is 50-1000 or 50 per cent. If the original reading were 72 and the reading under pressure 54, then the material would be 54-74 or 75 per cent hard. Of course, a completely incompressible material would register 100 per cent hard.



The Widney Resiliometer

Suppose that when the reading under pressure has been taken, the weight is lifted off as provided in the instrument by moving quadrant, then the natural resiliency of the material will at once assert itself, causing the micrometer needle to spring back. The amount of recovery in the thousandths of an inch is noted. From this is determined the percentage of resiliency. Suppose that a material which has registered 50-1000 of an inch under pressure, recovers instantly to 80 after weight is taken off, the recovery then amounts to 30, which is 3/5 of 50, or the thickness under pressure, giving us a percentage of resiliency of 60.

In view of the fact that the "Resiliometer" reads to the thousandths of an inch, it is obvious that the number of possible combinations of specifications, showing thickness, hardness and resiliency is extremely large. Almost any conceivable combination of qualities can thus be specified.

DETERMINATION OF SPECIFIC GRAVITY OF WOOD

By J. A. NEWLIN

In Charge Section of Timber Mechanics Forest Products Laboratory, Forest Service

AFTER selecting a representative sample of material, the method of determining the specific gravity is as follows:

Procedure for Oven-dry Specific gravity
Based on volume at test

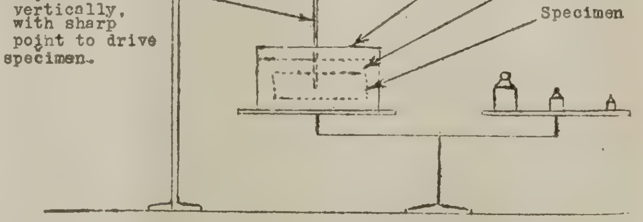
1. Find volume of sample by measurements or by method below. (Measurements preferred.)
2. Put into a drying oven at 212° Fahrenheit (100° Centigrade) and dry until constant weight is attained.
3. Weigh sample.
4. Sp. Gr. $= \dfrac{D}{V_1}$

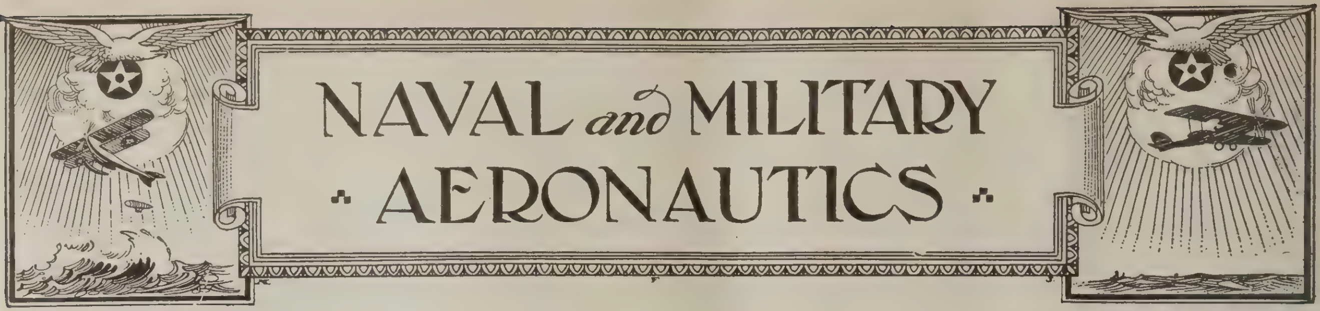
Procedure for Oven-Dry Specific Gravity
Based on oven-dry volume

A. Put into a drying oven at 212° F. (100° Centigrade) and dry until constant weight is attained.
B. Weigh sample.
C. Find volume of sample by measurements or by method below. (Method below preferred.)
D. Sp. Gr. $= \dfrac{D}{V_o}$

D = oven-dry weight in grams as determined under 3 or B.
V_1 = volume in cubic centimeters at test as found under 1.

(*Continued on page* 55)


Container
Light rod, adjustable vertically, with sharp point to drive specimen.
Water
Specimen



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Signal Corps recruit depot, Fort Wayne, Mich., for duty with construction troops.

Note 3—Proceed to Curtiss Aeroplane & Motor Corporation, North Elmwood Plant, Buffalo, and report to Major Edward S. Moore.

Note 4—Assigned to duty with division of purchases, storage, and traffic, General Staff.

Note 4—Proceed to Miami, Fla., Key West, Fla., such points in Cuba, Haiti, San Domingo and Porto Rico as may be necessary, and then return to Washington, D. C.

Note 6—Report to district manager of equipment, 480 Lexington Ave., N. Y. C.

Special Orders 105 to 109, Inclusive

A

Acheson, Alexander M.	DIK
Appleton, James L.	DIK
Arnold, Leslie P.	DIK
Appleton, Francis L.	DIK
Arnold, Ivan T.	FRF
Abel, George R.	CUI
Apgar, Frank Fletcher	SLR; DIK
Amster, Harry	SLR; KST
Allen, Joseph C.	RTR
Allen, Albert G.	FRF; DIK
Adams, James D.	FRF
Abels, Walter J.	DIK
Alvord, Lincoln	EOT
Aydell, Jerome J.	RTR
Archibald, James A.	DIK
Armstrong, Noel	SLR; BST
Adams, Orson, Jr.	SLR;WAC
Ames, Edwin Neal	SLR; WAC
Allan, Thomas Henry	SLR; KST
Allen George Edwin	SLR
Atwater, Frank G.	SLR
Aubineau, Marion J.	SLR
Anthony, Whiting	FLR
Armstong, Donald H.	FLR
Archibald, Norman S.	SLR
Avorill, Charles Mills	SLR
Amberg, Irwin S.	SLR
Anderson, Werner	DIK
Allen, Albert A.	PFO
Arnold, George M.	PFO
Allan, Roy F.	DIK
Angelsey, James Joseph, Jr.	SLR; KST
Archibald, James A.	FRF
Armstrong, Ralph S.	DIK

B

Bryant, Gordon S.	DIK
Blatz, Edgar P.	FRF
Bailey, Foster	DIK
Buckler, Douglas A.	DIK
Barnes, Harold L.	DIK
Brinkman, Walter E.	FRF; DIK; SLR
Beelby, Frederick Loveland	SLR; SBI
Butler, William Edward	SLR; SMM
Beehler, George Howard	SLR; FRF
Bell, Harold Dudley	SLR; KST
Bell, Ralph Earl	SLR; KST
Bell, William H.	SLR; DIK
Bell, James Avery	SLR; KST
Brammer, George Abraham	SLR
Brown, Clarence Wilfred	SLR; KST
Brown, Horace E.	RTR
Brown, Nathan W.	RTR
Brown, Clifford A.	EOT
Brown, Reuben J.	DIK; FRF
Bermant, Lester C.	EOT
Bumpus, Morris Everett	SLR; KST
Beattie, Theodore L.	SLR; DIK; FRF
Bogert, Howard Z.	EOT
Boothby, Wallace J.	EOT
Boatright, Bernard D.	EOT
Butler, Frederick W.	SLR; AAD
Butterworth, Russell Irvin	SLR; PFO
Buell, Harry Cramphin	SLR; PFO
Brady, William C.	CPR
Beers, Georg M.	CPR
Baker, John A.	RTR
Burbank, William A.	ASM
Beaton, Paul Alfonso	CPR
Berkeley, Scott Bruce	FRF; SLR
Banks, William Foster	CPR
Binnings, Clem. P.	RTR
Brogan, Lawrence E.	RTR
Ball, Arthur W.	RTR
Barham, James E.	RTR
Bautz, Louis M.	RTR

Beckman, Leo J.	RTR
Britt, Maurice Stevens	SLR; CWT
Bretting, William H.	FRF
Beem, Cash C.	DIK
Boyle, George L.	FRF; SLR
Bass, Michael	CPR
Bartlett, Charles M.	SLR
Bell, Henry V.	FLR
Blackman, Jay B.	FLR
Bowden, Floyd M.	FLR
Broomfield, Hugh D. C.	FLR
Bures, George E.	FLR
Batchelder, Sidney S.	FLR
Beauchamp, Oliver T.	FLR
Bone, David Shelby	FLR
Boucher, James D.	FLR
Brubaker, Henry J.	FLR
Baird, Chester A.	SLR
Baker, Solomon F.	SLR
Beeks, Herbert S.	SLR
Benton, George A., Jr.	SLR
Berg, Edwin Louis	SLR
Blackman, Clifford L.	SLR
Blackburn, Daniel McM.	SLR
Blake, George E.	SLR
Block, Harold G.	SLR
Boucher, Clarence Kinne	SLR
Brandenburger, Walter Otto	SLR
Brewster, Morell Kenneth	SLR
Brooks, Merrill Pillsbury	SLR
Brown, Stanley Pincott	SLR
Brumback, Jefferson Upton	SLR
Bardwell, Allen E.	CJW
Bailey, Raymond L.	DIK
Benjamin, Everett F.	DIK
Bishop, Miller V.	CSO
Barrett, William J. L.	DIK
Brown, David K.	DIK
Burns, Leroy W.	DIK
Batt, Joseph S.	FRF
Barrett, John M.	DIK
Bateman, George L.	PFO
Blum, Clarence A.	PFO
Barton, Paul W.	DIK
Bader, Eugene F.	DIK
Bell, Robert W.	DIK
Butler, Roy J.	DIK
Butts, Daniel E.	DIK
Bartholomew, Robert	MIT
Burns, Ruel F.	SLR; MIT

C

Charlton, Howard C.	FRF
Chandler, George Ernest	SLR; SMM
Clark, Anson L.	AGC
Clark, Franklin William	SLR; CWT
Clark, George Albert	SLR; KST
Clark, Denny A.	SLR; EOT
Clark, Ernest C.	MAC
Conway, James Vincent	SLR; RWT
Chapman, Allen	SLR; CWT
Connolly, Louis S.	CSO
Crawford, Charles Butler	SLR; KST
Christianson, Ove Carl	SLR; KST
Curle, Marvin Emmett	SLR; KST
Cottrell, Clifton Carlyle	SLR; CWT
Conway, Thomas J.	RTR
Cottrell, Roy W.	SLR; FRF; DIK
Cady, Duane Cliff	SLR; KST
Cammack, Howard Eugene	SLR; KST
Christensen, Albert Martin	SLR; KST
Coleman, Charlie Dubose	SLR; KST
Cannon, Thomas O.	EOT
Cutter, Charles E., Jr.	DIK
Conrad, Max H.	DIK
Chapin, Donald Abner	SLR; KST
Connolly, Patrick Joseph	SLR; KST
Chamberlain, Noel	MAC
Cope, Jesse D.	CPR
Carpenter, Earle J.	DIK
Cook, Edward P.	FRF; DIK
Cook, Frank L.	SLR; FRF; DIK
Crockett, George S.	SLR; FRF; DIK
Collins, Henry T.	SLR; FRF; DIK
Coulbourne, Joseph O.	SLR; FRF; DIK
Cannon, Thomas O.	EOT
Crandall, Norris I.	EOT
Chilton, Ralph H.	SLR; MIT
Conklin, Claude R.	MAC
Clapp, Algernon R.	EOT
Cargo, Hugh Gibbs	SLR; CWT
Crump, Don Mills	SLR
Crippen, John Harry	SLR
Cox, Arthur Stanley	SLR
Conway, John Arthur	SLR
Cooke, Walter Ross, Jr.	SLR
Cloyd, Bert Reese	SLR
Clampett, Frederic William, Jr.	SLR
Campbell, William Montgomery	SLR
Campbell, Thomas atterson	SLR
Cohen, Abraham	SLR
Cooper, Elmer E.	SLR
Carpenter, Lawrence W.	FLR
Cauchon, Leo B.	FLR
Clement, Arthur F.	FLR
Collins, Carl I.	FLR
Colton, Samuel H.	FLR
Cotton, John R.	FLR
Cunningham, Raymond P.	FLR
Caldwell, Fenton	FLR
Carrett, Philip L.	FLR
Chadderton, George H.	FLR
Cline, Charles S.	FLR
Colman, Henry L.	FLR
Copeland, John P.	FLR
Crumbaugh, Harry W.	FLR
Custis, Marvin K.	FLR
Chalmers, James Earl	SLR; KST
Connolly, Cecil H.	FRF
Clark, Walter D.	DIK
Cummings, Roland R.	FRF
Campbell, Dudley R.	DIK
Campbell, Alexander	DIK
Creighton, William J.	MIT
Crary, Roy P.	CSO
Conroy, Thomas P.	PFO
Conway, John S., Jr.	PFO
Carroll, Alfred B., Jr.	PFO
Cragin, Arthur B., Jr.	CJW
Cretsinger, Clyde F.	CJW
Clement, John V., Jr.	CSO
Crane, George A.	DIK

Lt. A. F. Winslow, of Chicago, at center, is credited with having downed the first German machine by an American aviator under American colors. At his left is Lt. Douglas Campbell, who brought down the second German machine. Major John Huffer, at the right, has been officially credited with four machines

D

Dunnington, Clyde C.	FRF
Daniels, Harry Baldwin	SLR; BST
Day, Frederick Samuel	SLR; AAD
Dayton, James W.	SLR; FRF
Dayton, William H.	FRF
Dayton, Theodore R.	SLR; DIK; FRF
Donohoe, Joseph M.P.	SLR; FRF; DIK
Drayton, Emlen M.	FRF
Donnelly, Clarence E.	FRF
Davis, William R.	SLR; FRF
Davison, Vern Cecil	SLR; KST
Derickson, Clarence John	SLR; KST
Davis, Robert Harris	SLR; WAC
Dowdall, Joseph	DIK
Dobbs, Silas A.	SLR
Dudley, Howard W.	RTR
Drew, Harold R.	MAC
Davis, Ira Guy	SLR; KST
Davey, John A.	SLR; AAD
Davis, Earl A.	EOT
Dichman, Ernest W.	FRF
Dunlap, Lionel H.	SLR; DIK
Dingeman, Henry I.	SLR; DIK
Desmond, James P.	DIK
Deason, Roland R.	RTR
Dodge, Percival	CPR
Denie, George Russell	SLR; CWT
Dudley, William McK.	SLR
Davis, Lloyd E.	SLR
De Arce, LeRoy P.	SLR
Day, Ewing W., Jr.	FLR
Dorsey, George C.	FLR
Davis, Williston N.	FLR
Daumont, Louis Burhans	SLR
DeLano, Stafford Andruse	SLR
D'Hodge, Wylie Fort	SLR
Dorian, Frank Easton	SLR
Duryea, Leslis Noyes	SLR; PFO
Diebel, Alfred J.	Note 2
Dodd, Spencer Samuel	SLR; PMT
Davis, Charles T.	FRF
Du Pree, William E.	DIK
Denham, Thompson B. S.	DIK
Diggs, Earl H.	CJW

Major George Krapf, the commanding officer of Chanute Field, Rantoul, Ill.

E

Edwards, David Benjamin	SLR; KST
Edwards, Frank M.	RTR
Eastburn, Lacey Arnold	SLR; WAC
Edmonston, Arnold Hubert	SLR; KST
Edmund, Harvey W.	DIK
Ellershaw, William	SLR; PFO
Eaton, Samuel C.	FRF
Elbert, Frederick J.	RTR
Elbert, Milton R.	RTR
Ellis, Lyman R.	MDO
Eliott, Kerley C.	SLR; FRF
Elliott, Edward B.	SLR
Elliott, Marion C.	SLR
Eaton, Alfred V.	SLR
Ennis, James S., Jr.	SLR
Eyman, Bradford	SLR
Eager, Alfred Gifford	SLR
Erikson, Erik Algot	SLR
Eustis, Edwin Markwick	SLR
Evans, Floyd Wyatt	SLR
Everett, Edward C.	SLR
Ellis, Howard I.	DIK
English, Roy R.	SPD
Elston, Welcome B.	DIK
Emerson, Sigard A.	FRF
Emmerich, Edmund M.	FRF

F

Foster, Esty	SLR; FRF; DIK
Fitch, Victor Ward	SLR; WAC
Faulkner, David Clarkson	SLR; RWT; FRF
Fitzgerald, Joseph Bernard	SLR; KST
Folsom, Leon	SLR; MIT
Fox, Russell R.	SLR; FRF; PFO
Frankenberg, Edward S.	FRF
Fleming, George Adair	SLR; PFO
Fuller, Eldon F.	RTR
Fagg, Fred Dow, Jr.	FRF
Fiske, Leslie Beal	SLR; KST
Friedley, Jacob D.	WAC
Fendrick, Raymond S.	SLR; FRF
Flinn, Frank	RTR
Floyd, George D.	MDO
Feder, Joseph Brown	SLR; PFO
Forbes, Oliver D.	SLR; DIK; FRF
Foote, John M.	SAG
Fraser, Dean B.	MIT
Fleming, Eugene C.	SLR; FRF
Fariss, Seaton G.	CWT
Francis, Roy N.	CPR
Foote, Kenneth M.	DIK
Follmer, Harold W.	FLR
Fry, Clarence H.	FLR
Fithian, Robert G.	FLR
Forsythe, William J.	FLR
Furlow, George W.	FLR
Fletcher, Ward B.	SLR
Farren, Philip H.	SLR
Fischer, Conrad Joseph	SLR
Francisco, William Hale	SLR
Friday, Curtis Roy	SLR
Flook, Harry E.	PFO
Frey, Frederick G.	CSO
Fish, Frederick L.	DIK
Fuller, Thomas J. D.	TFT
Fowler, Lester A.	DIK

G

Gramlich, Alois (Louis) Trumble	SLR; KST
Guillaudeu, Dudley	SLR; KST
Griswold, Stephen Rose	SLR; EOT
Grover, Ralph J.	PUP
Green, John Rouzee, Jr.	SLR; WAC
Graves, Henry L.	SLR; FRF; DIK
Gilligan, Frederic M.	SLR; FRF; DIK
Goss, Lewis W.	DIK
Graetz, Walter Carl	SLR; PFO
Gober, James L.	DIK
Grimes, Gerald E.	DIK
Griffee, Jan Hal	SLR; KST
Goodell, Joseph E.	RTR
Grout, John C.	RTR
Guinn, Frank R.	RTR

Scene at a French Aviation Training Camp. French Official Photo.

Granville, Bernard R. .... FRF
Gardner, Grandison .... MAC
Gee, Clough F. .... RTR
Gordon, Ambrose .... RTR
Garesche, Claude Francis .... SLR; FRF; RWT
Grafa, Clare .... FRF
Garrison, Russell P. .... EOT
Griggs, Walter A. .... SLR; KST
Gude, Adolph Elbert .... SLR; CWT
Gallagher, Joseph Jackson .... SLR; CWT
Gregory, Omar B. .... SLR
Giffin, James L. .... SLR
Gartz, Adolph Frederick, Jr. .... SLR; SAG
Gendron, Leon Pierre .... SLR
Green, Lonsdale, Jr. .... SLR
Goddard, Fred Carroll .... SLR
Gordon, Harold Ryan .... SLR
Guffanti, Alexander Joseph .... SLR
Gilmartin, Rex F. .... FLR
Graham, Donald G. .... FLR
Goldthwaite, George E. .... FLR
Greene, Frederick William .... SLR; PMT
Graham, Gregory Nowell .... SLR; PMT
Gause, George E. .... DIK
Graves, Gilbert S., Jr. .... DIK
Glos, Walter A. .... DIK
Galinger, George W., Jr. .... PFO
Gude, Adolph E. .... DIK

H

Hurlburt, Edwin H. .... SLR; CRI
Hitchcock, Francis Bennett .... SLR; OSU
Howard, Sam .... SLR; WAC
Hoffman, Joseph K. .... SLR; FRF; DIK
Hemming, Henry Theodor .... SLR; KST
Hodge, George Edwin .... SLR; KST
Hyman, Walter Reamy .... SLR; KST
Hanson, Arthur Mathisen .... SLR; KST
Hoban, Ewdin Anthony .... SLR; KST
Harkins, William H. .... FRF
Hebberd, James L. .... DIK
Hastings, Morris O. .... DIK
Hargleroad, William Brownley, Jr. .. SLR; KST
Heckel, John Thomas .... SLR; KST
Huszagh, Victor Lee .... SLR; KST
Hegan, Chester P. .... FRF
Henderson, Dewitt T. .... SLR; FRF
Haldeman, James F. .... Note 2
Haag, Samuel M. .... RTR
Hampton, Jesse H. .... RTR
Henry, Silas G. .... RTR
Hohlt, Herbert C. .... RTR
Hood, Randolph Mc C. .... RTR
Hooks, James E. .... RTR
Hunley, John B. .... RTR
Hoffman, Charles R. .... EOT
Higgins, Charles C. .... DIK
Hornig, William F. .... SLR; DIK
Hazelton, Herbert Hazard .... SLR; WAC
Heydorn, Harvey G. .... FRF
Hilmer, Edwin H. .... CUI
Halsted, Harold C. .... SLR; DIK
Heyden, Arthur L. .... DIK
Hawley, Edgar T. .... CPR
Harrison, William F. .... RTR
Haskell, LeRoy .... RTR
Hegner, John R. .... RTR
Hicatt, James P. .... RTR
Hoffman, Harry O. .... RTR
Hutchens, Arthur R. .... RTR
Harlan, Roger, K. .... SLR; FRF
Haen, Arthur G. .... SLR; DIK
Hicks, John Wesley LaFayette .... SLR; WAC
Hollingsworth, John Y. .... FRF
Harrison, Landreth M. .... DIK
Hodges, James P. .... DIK
Herring, Lloyd H., Jr. .... DIK
Harris, Benjamin T. .... SLR; DIK
Helmle, George B. .... CSO
Hodain, Barney Ray .... SLR; WAC
Hancock, John M. .... SLR
Hereford, Herbert W. .... SLR
Honsinger, Frank T. .... SLR
Houser, Paul F. .... SLR
Halley, Walter F. .... FLR
Hewitt, Ernest W. .... FLR
Hanna, Frederick W. .... FLR
House, David L. .... FLR
Haff, Warren Coleman .... SLR
Hammond, Reginald Gilbert .... SLR
Haines, Harold Hobby .... SLR
Hays, William Worth .... SLR
Heanue, Francis William .... SLR
Hickmott, De Garmo .... SLR
Higgins, James Worthington, Jr. .... SLR
Hinman, David Ertzberger .... SLR
Harrs, Edward Otto .... SLR; CSO
Hawkridge, Lester D. .... Note 3
Hoye, Vincent J. .... CJW
Hanst, Charles E. .... DIK
Hornig, William F. .... FRF
Hickmott, John T. .... DIK
Haen, Arthur G. .... FRF
Hodges, James P. .... FRF
Heck, George L., Jr. .... PFO
Hegenberger, Albert F. .... PFO

I

Ivins, Maurice H. .... SLR; FRF; DIK

J

Joyce, Alfred Martin .... SLR; KST
Johnson, Amos H. .... SLR; FRF; DIK
Johnston, Jesse M. .... RTR
Johnson, Allison F. .... EOT
Johnson, Bayard .... FRF
Johnson, Charles B. .... SLR; DIK
Juul, Earl Herold .... SLR; KST
Jordan, Homer Garfield .... SLR; KST
Jordan, Clinton C. .... RTR
Joplin, John F. .... RTR
Jaynes, Jesse I. .... CPR
Jones, Montgomery O. .... FRF
Jorstad, Floyd Oswald .... SLR; PFO
Joseph,, Orville Earnest .... SLR; PFO
Jensen, Charles C. .... SLR
Jenkins, Edward .... FLR
Jolliff, Vaughn J. .... FLR
Jones, David R. .... FLR
Jordan, Ralph B. .... FLR
Jenks, Carlton H. .... FLR
Jones, Cleaves A. .... FLR
Johnson, Conrad G. .... FLR
Joyce, Maurice J. .... FLR
Johnson, George Elmer .... SLR
Jones, Leland Sheldon .... SLR
Joscelyn, Douglass Louis .... SLR
Just, George Alexander, Jr. .... SLR
Jacobi, William J. .... CSO
Jones, John H. .... FRF
Johnson, Frank A., Jr. .... FRF; PFO
Johnson, Cortlandt S. .... FRF
James, John E. .... DIK

K

Kirchdorfer, William Frederick ..... SLR; KST
Kimball, Alron H., Jr. .... SLR; FRF; DIK
King, William C. .... TMA
King, Olen .... FRF
King, Truman E. .... RTR
Kinsey, Zebulon Bradley .... SLR; KST
Killingsworth, Roger T., Jr. .... RTR
Kelly, Thad R. .... RTR
Kistenmacher, Henry M. .... RTR
Klaus, Otto .... SLR; KST
Kaufmann, Godfrey F. .... TMA
Killerin, George W., Jr. .... DIK
Kraft, Milton J. .... DIK
Kendall, Hayward H. .... CPR
Kerr, Henry Drewry .... SLR; WAC
Knox, James E. .... SAG
Kern, Frederick M. .... FRF
Keyes, Charles S. .... SBI
Krieger, John E. .... DIK
Kent, George S. .... FRF
Koehler, George, Jr. .... SLR; CAF
Kennedy, Neal C. .... SLR; KST
Keyes, James Frederick .... SLR
Killerin, George William, Jr. .... SLR
Kirkpatrick, Ross Corbett .... SLR
Kohler, Charles Stephen, Jr. .... SLR
Kraft, Milton John .... SLR
Kiley, James E. .... SLR; PFO
Kuhlman, Roy A. .... SLR
Kaiser, Cyrus H. .... FLR
Kaylor, Emmet M. .... FLR
King, Ned E. .... DIK
King, Allan H. .... SLR; WAC

L

Little, Edwin Coffin, Jr. .... SLR; PMT
Lynch, John Andrew .... SLR; KST
Ladd, Arthur K. .... RTR
Lowther, Harry A. .... RTR
Lyne, Joe A. .... RTR
Leffler, Claude W. S. .... FRF; VCB
Leland, George Edmund .... SLR; KST
Lehr, Robert P. .... FRF
Lake, Harley W. .... CPR
Larson, William H. .... RTR
Long, Winfred R. .... SLR; FRF; DIK
Lepage, Felix .... SLR; KST
Lily, Roy M. .... WAC
Luttrell, James C. .... MAC
Lane, Orlando H. .... FRF
Lawton, Malcolm S. .... FRF
Lynch, William T. .... WFO
Lees, Herbert G. .... DIK
Lee, John F., Jr. .... EOT
Leyden, Edward A. .... EOT
Lowry, James Timothy .... SLR; WAC
Logan, Henry J. .... DIK
Lestrade, Harold J. .... DIK
Litterer, Robert R. .... SLR; FRF
Lord, Orlando Merritt .... SLR
Landon, Edward C. .... FLR
Lorick, Harold A. .... FLR
Leckie, William C. .... FLR
Loth, Carl C. .... FLR
Lovell, Lawrence C. .... FLR
Lundgren, Fridolph .... FRF
Lawson, Lawrence A. .... CJW
Lane, Ray .... FRF
Lundberg, George C. .... FRF
Lott, Arthur LeRoy .... SLR; KST
Lovelace, Lake .... DIK

M

Mowry, Lewis deRiggs .... SLR; WAC
Martin, John Mofrill .... SLR; WAC
Milling, Wear Francis .... SLR; WAC
Mills, Stratford Denman .... SLR; WAC
Maurice, Benjamin Van Dyke ...... SLR; EOT
Malmgren, Carl E. .... FRF
Marshall, Robert D. .... RTR
Martin, William F. .... RTR
Marble, Lee B. .... RTR
Marriott, Charles A. .... RTR
Morris, Thomas K. .... RTR
Mulnix, Robert K. .... RTR
Miller, Elmer Anthony .... SLR; GLC
Miller, Royal .... MAC
Miller, Edward H. .... MIT
Marsh, William Alexander .... FLR
Mauldin, Archie A. .... DIK
Mote, Sharon R. .... DIK
Minturn, Benjamin E. .... SLR; FRF; DIK
Meister, Louis G. .... MIT
Moss, Harry S. .... DIK
Morehart, Malcolm Butler .... SLR; KST
Matthews, William M. .... RTR
Magee, James M. .... CPR
Magee, Davis W. .... DIK
Martin, David M., Jr. .... DIK
Maxwell, Maurice F. .... DIK
Meeker, Nathaniel H., Jr. .... DIK
Miller, Rolfe T. .... DIK
Moses, Lester E. .... DIK
Mehaffey, Carl Alexander .... SLR; KST
Murphy, William H. .... MIT
Markley, John B. .... CUI
Moulie, Eugene S. .... FRF; DIK
Myers, Joseph A. .... DIK
Moulds, Millard Harold .... SLR; PFO
Malone, Gilbert .... DIK
Moyler, George A. .... FRF
Mahan, Harry B. .... CPR
Montgomery, Kenneth Rider .... SLR; KST
Martin, Philip P. .... FLR
Mendenhall, Joseph H. .... FLR
Merrill, John F. .... FLR
Mitchell, Wildey H. .... FLR
Muchmore, Ernest C. .... FLR
Melton, Waverly .... FLR
Matthews, Walter N. .... FLR

Mero, Ralph M.	FLR
Milham, George P.	FLR
Monroe, Thomas	FLR
Murray, John N.	FLR
Macklin, Harold D.	SLR; PFO
Micelli, Paul	SLR
Mook, Harold F.	SLR
Mook, Samuel R.	SLR
Moore, Maurice H.	SLR
Moulic, Eugene S.	SLR
Marvin, Arthur Burdette	SLR
Maxim, George William	SLR
Mesneir, Edward Slevin	SLR
Miller, Lester John	SLR; PFO
Moran, George Sherman	SLR
Moore, Robert Glenn	SLR
Moore, Walter Francis	SLR
Munoz, Francis Miguel	SLR
Murphy, Clement John	SLR
Mathews, James C.	DIK
Moore, James, 2d.	KST
Marshall, Richard H.	DIK
Martin, David J.	DIK
Mapes, Donald D.	PFO
Mayhew, Zeb.	UIU
Maxwell, William C.	DIK
Montgomery, Caleb E.	FRF
Montgomery, Harry G.	CJW
Meyer, Walter W.	DIK
Merkel, Louis J.	DIK
Minshall, Robert	DIK
Maloney, Arthur M.	DIK
Morse, Eugene D.	DIK
Moore, John S.	DIK
Miller, Harold G.	Note 6

Mc

McCoy, John F.	SLR; MIT
McCoy, Charles D.	SAG
McMahon, Michael J.	MIT
McClendon, Aurelius Edward	SLR; KST
McNaughton, John E.	UTA
McBride, Walter E.	SLR; FRF; DIK
McDowell, Lamont Anderson	SLR; DIK
McPeak, Norman B.	FRF
McKellip, Spencer W.	DIK
McCanna, Edwin Thomas	SLR; KST
McCarty, Walter R.	DIK
McShane, John Joseph	SLR; WAC
McNally, Leo Frank	SLR; LHV
McCabe, Ross	SLR
McCaffrey, Aubrey L.	SLR
McDuffie, Jasper K.	SLR
McKenna, Edmund P.	SLR
McKinless, Raymond	SLR
McLean, Robert P. H.	FLR
McWhorter, Ray S.	FRF
McGiffin, Francis R.	FRF
McCabe, Edward L.	FRF
McConnell, Thomas E.	DIS
McAleenan, Henry Alvin	SLR; PMT
McCullough, Roger S.	CJW
McCutcheon, Mack D.	CJW
McCarron, Henry A.	DIK
McHatton, Thomas H.	REV; Note 5

N

Nelson, Arlen C.	DIK
Nevin, John, Jr.	DIK
Neal, William Stehman	SLR; WAC
Noble, William H.	FRF
Naylor, Hugh T.	RTR
Newland, Philip John	SLR; KST
Neubauer, Charles Martin	CPR
Newman, James J.	CSO
Neely, Marvin Y.	RTR
Nicholson, Henry W.	FLR
Neal, Marshall S.	SLR
Nelson, Roy A.	SLR

O

O'Neil Joseph H.	FRF; DIK
O'Sullivan, Maruice Joseph	SLR; WAC
O'Fallon, William G.	DIS
O'Connell, John J.	LDT
Orr, George Allman	SLR; KST
Ogg, Lester	SLR; KST
Ordway, Lucius P.	FRF
Osanne, Porter L.	DIK
Ogilvie, Alexander Kaye	SLR; FRF
Olin, Alfred L.	SLR
O'Brien, Raymond Keran	SLR
Orr, Harold Edward	SLR
Otis, Thomas Fred	SLR
O'Shea, Edward M.	DIK
Orr, Dale	DIK
Ovitt, Kenneth C.	CJW

P

Pratt, John Williams, Jr.	SLR; KST
Penberthy, Paul	FRF
Pepper, John P.	FRF
Patton, William Duncan	SLR; KST
Pawley, George P.	FRF
Patterson, Stuart R.	FRF
Perkins, Arthur	SLR; WAC
Pilatsky, Louis	SLR; FRF
Pinney, Kyle J.	FRF
Pritchard, Albert	SLR; WAC
Pyne, Meredith H.	FRF
Pedrick, William J., Jr.	SMM
Pridham, James Bertrand	SLR; KST
Perry, William L.	DIK
Phillips, Robert F.	DIK
Pross, Edwin Charles	SLR; KST
Phills, John S.	CGC
Pettingell, John Mason	SLR; DIK
Page, Charles Morton	SLR; KST
Patterson, Frank S.	MDO
Prather, Carrol W.	RTR
Puckett, Roswell Clair	SLR; KST
Pascall, Albert B.	RTR
Poyner, Thomas M.	RTR
Palmer, Summer Chase, Jr.	SLR
Parker, Herbert Nichols	SLR
Parshall, Raymond Palmer	SLR
Pattiani, Alois William	SLR
Pendleton, Archibald Forbes	SLR
Peterson, James Hopper	SLR
Pettingell, John Mason	SLR
Polk, Latham	SLR
Pyle, Albert Forbes	SLR
Platt, Franklin N.	FLR
Porter, Robert B.	FLR
Peterson, William B.	FLR
Plush, Lewis C.	FLR
Parsons, Arthur M.	SLR
Prior, Roger W.	SLR
Pulliam, Ralph C.	SLR
Pauli, Paules H.	DIS
Peabody, George H.	MIT
Poulin, John A.	PFO
Pyke, Charles L.	PFO
Pheatt, Merrill N.	DIK
Parmlee, Charles R.	DIK
Prestridge, Robert Wade	SLR; WAC
Prosser, Frank H., Jr.	DIK
Pinckney, Gerald J.	DIK

Q

Quinn, Thomas Charles	SLR
Quinn, John Joseph, Jr.	FLR

R

Reddington, William F.	DIK
Reed, Harvey S.	DIK
Richardson, Frederick Stuart	SLR; WAC
Robertson, James B.	SLR
Roberts, Gerald Iredale	SLR; RWT
Rask, Peter Selmer	SLR; LDT
Reid, Kenneth M.	SLR; FRF
Riseman, Joseph	DIS
Robinson, Gwynn	REL; WAC
Robinson, Frank P.	RTR
Robinson, Edward A.	CPR
Roberts, George I.	FRF
Raabin, Herman David	SLR; KST
Ramey, Howard K.	FRF
Rich, Don O.	DIK
Randolph, Roy J.	RTR
Reilly, James Francis	SLR; TMA
Reilly, Lloyd V.	RTR
Rhodes, Roy K.	RTR
Russell, Emerson C.	DIK
Ratliffe, George T,	DIK
Robinson, Isador	SLR; KST
Reavis, Charles F., Jr.	FRF
Roe, James A., Jr.	EOT
Rollins, Joseph R.	DIK
Rivers, Harold R.	DIK
Royster, Royall H.	DIK
Rowe, William James	SLR; PFO
Ravenel, William De C., Jr.	SLR
Rose, Joseph E.	SLR
Raibourn, Claude	SLR
Reakirt, Robert Howard	SLR
Reid, Kenneth Alexander	SLR
Ristine, Richard Harrison	SLR
Roberts, John Jay	SLR
Roberts, Joseph Berry, Jr.	SLR
Roll, Frederick August	SLR
Rollins, Joseph Rickar	SLR
Rose, Elmer Jack	SLR
Rosson, Horace G.	SLR
Rugh, Charles V.	SLR
Raine, Burton D.	FLR
Randolph, Walter W.	FLR
Riley, Harold W.	FLR
Ross, Harold K.	FLR
Raferty, John Howard	FLR
Ranck, Earl D.	FLR
Richards, Arthur S.	FLR
Rogers, William E.	FLR
Rundley, Harry D.	FLR
Richardson, Ralph E.	PFO
Rogers, Frank W.	PFO
Rubel, James L.	PFO
Rowson, Walter	FRF
Rowe, Hiram H.	DIK
Ross, Harry S.	FRF
Reading, William M.	CSO; SMM; Note 1
Rollins, Joseph R.	FRF
Roberts, Francis M.	DIK
Rose, Glen Walter	DIK
Ransone, Philip G.	FRF

S

Sheffield, Loren C.	FRF; DIK
Smith, William Harry	SLR; KST
Smith, Milton John	SLR; KST
Smith, Ellis Glenn	SLR; KST
Smith, Harold D.	DIK
Smith, Fred H.	DIK
Smith, Paul Parr	FRF
Smith, Stanley	DIK
Smith, Clarence A.	SLR; DIK
Sanders, Randolph R.	SLR; FRF; DIK
Sanders, James O'H.	FRF; DIK
Sills, Archie L.	EOT
Saner, Orlando Bryant	SLR; KST
Swanson, William Wayne	SLR; KST
Stringer, Lyle Emory	SLR; KST
Schram, Herman	SLR; FRF
Sweeney, Raymond W.	SLR; FRF; DIK
Stanton, Edgar	CUI
Snyder, W. Hill	FRF
Sleete, Claude W.	FRF; EOT
Sullivan, Paul	EOT
Stevenson, Richard W.	SLR; FRF; DIK
Stephenson, Lovick L., Jr.	SLR; FRF; DIK
Stoddard, Marvin	FRF
Simmons, William R.	RTR
Simmons, Robert G.	FRF
Stein, Charles Jacob	SLR; WAC
Sims, Boyd Raphael	SLR; KST
Stond, Ephraim Shepherd	SLR; BST
Stephens, Frank M.	WAC
Shrader, Harlan L.	DIK
Stoffregen, Hugh M.	SLR; FRF; DIK
Strahan, Donald P.	SLR; FRF; DIK
Sherman, Thomas B.	RTR
Scarborough, William T.	RTR
Shaver, Robert B.	RTR
Simmons, Joel M.	RTR
Shackleton, Allen D.	MAC
St. Clair, Gordon C.	DIK
Stollenwerck, Guy	FRF; SLR; DIK
Stees, Donald B.	MIT
Stenberg, Bernard A.	SLR; DIK
Staley, Mortimer L.	FRF

(*Continued on page* 557)

Marshal Joffre inspecting equipment and personnel at a French Aviation Field. French Official Photo.

FOREIGN NEWS

FRANCE

The French official announcement of May 15th describes successful aerial combats and bombing activity, as follows:

"There was great activity on the part of both artilleries in the region north of the Avre. A raid attempted by the enemy against our trenches southeast of Juvincourt was without result.

"Two German aeroplanes were brought down on May 12, and two others on May 14. On the night of May 14 one of our groups bombed the railway station at Chatelet-sur-Retourne (Ardennes), on which 7,000 kilos of projectiles were dropped. The same night German aviators bombed the neighborhood of Dunkirk, but the damage was unimportant, and there were no casualties."

Reporting on aerial operations on May 16th, the French official announcement states:

"On May 15 our pursuit machines were extremely active in the air. Eighteen German planes were brought down and four captive balloons were set on fire."

An official statement dated May 17th, telling of recent air fighting, says:

"Our aviation squadrons have been active. On Tuesday night (May 14th) a number of our aviators participated in bombardments of the zone occupied by the enemy, 36,000 kilograms (nearly thirty-seven tons) of projectiles being dropped on railway stations, communications and aerodromes at St. Quentin, Jussy, Flavy le Martel, Nesles and Ham. Munition depots were exploded at Nesles and large fires were observed at Guiscard and Chatelet. The railway station at Nesles was burned.

"On the following night 30,000 kilograms (33 tons) were dropped on the same regions and 10,000 kilograms (11 tons) on the regions of Amage, Bucquoy and Montcornet. On May 16 four enemy aeroplanes were shot down and three others were gravely damaged.

"On the night of May 16 railway stations and German cantonments at Chaulnes, Roye, Nesles and St. Quentin received 25,000 kilograms (27 tons and a half) of projectiles and munition depots were destroyed. Fires and explosions were caused at other points."

Two raids were attempted against Paris on the night of May 15th; another attack was attempted on May 17th, but no casualties or damage resulted.

French airmen brought down 322 enemy aeroplanes during March and April, as compared with ninety-six French aeroplanes lost in the same period.

GERMANY

On May 13th the German War Office issued an official statement summarizing losses and victories for the month of April. As usual, these figures show greater losses on the Allied side than on the German, but the German losses only include those sustained in "aerial fighting." The text of the announcement follows:

"The losses to the enemy aerial forces on the German front during April amounted to fifteen captive balloons and 271 aeroplanes, of which 122 fell behind our lines, while others were seen to fall beyond the enemy's positions. In aerial fighting we lost 123 aeroplanes and fourteen captive balloons."

The official communication from the German General Headquarters issued on May 15th reports the following aerial activity:

"Our airmen yesterday shot down five enemy balloons. We have dropped numerous bombs on Calais and Dunkirk as well as the munition depots in the rear and railway establishments of the enemy."

The German War Office statement issued on May 16th describes the following aerial activity:

"The extensive use of airmen on the fighting front led to numerous aerial engagements. We shot down thirty-three enemy aeroplanes, fourteen of which were destroyed by the chaser squadron formerly commanded by Baron von Richthofen."

The official report of May 17th says:

"Yesterday eighteen enemy aeroplanes and one captive balloon were shot down."

GREAT BRITAIN

On May 13th a British official statement on aerial operations describes intense activity, despite unfavorable conditions, which lasted most of the day. The text of the statement reads as follows:

"Flying again was impossible Sunday (May 12th) until evening. The visibility then was excellent, and over eight tons of bombs were dropped on targets in the neighborhood of Menin, Armentières, La Bassée, and on the docks at Bruges. In aerial fighting six hostile machines were brought down. One of ours is missing.

"During the night fourteen tons of bombs were dropped on the railway stations at Don, Marcoing, Chaulnes, Bapaume, Peronne, and on the docks at Bruges. One of our machines did not return."

The British official statement on aerial operations on May 14th says:

"Flying was possible only for a few hours Monday during the early part of the day and 500 bombs were dropped on various targets. Two hostile machines were brought down in air fighting. None of ours is missing."

The British official statement on aerial operations issued on May 15th states:

"In the air fighting Tuesday (May 14th) six hostile machines were brought down, and one was driven down out of control. One was shot down by anti-aircraft gunfire, and one by infantry fire. Two of our machines are missing.

"Bombing continued actively during the night. Twelve tons were dropped on the railway stations at Lille, Menin, Chaulnes, and Peronne, on billets at Bapaume, and on the docks at Bruges. All our machines returned.

"On Wednesday a successful raid was made on railway station sidings at Thionville. Twenty-four heavy bombs were dropped. Bursts were observed on the railway sheds and track, and the furnaces of the Carlshutte factory, alongside the railway, were hit four times. All our machines returned safely in spite of the heavy anti-aircraft gunfire."

Very successful work on the part of the Air Forces are recorded in the official announcement issued on May 16th. The text of the statement follows:

"A great deal of work was done by our aeroplanes and observation balloons on Wednesday in conjunction with our artillery. Our bombing machines began their attacks at dawn and continued until dark, dropping over twenty-four tons of bombs on targets, including the railway stations at Tournai, Courtrai and Chaulnes and billets in the neighborhood of Douai, Baupame, Menin and the River Somme and on the Zeebrugge-Bruges Canal.

"Enemy aircraft was active in the early morning and again in the evening, hostile scouts attacking our bombing machines with particular insistence. Twenty-five German machines were brought down and twelve driven down out of control. One was shot down by machine gunfire from the ground."

A later official statement describing a successful bombing raid by British aviators was issued on May 16th, as follows:

"Early Thursday our aeroplanes set out to bomb the factories and railway station at Saarbrucken in Germany (involving a flight of 200 miles). On crossing the lines they were encountered by ten hostile scouts and a running fight took place along the entire way to our objective. By the time Saarbrucken was reached twenty-five hostile machines had collected and were attacking our aeroplanes with the utmost vigor. In spite of these attacks twenty-four heavy bombs were dropped on our objectives. Several bursts were seen on a railway and a fire was started.

"Having attained their objectives, our aeroplanes concentrated their efforts on fighting the enemy's machines, five of which were brought down. One of our machines was seen to be shot down. All of the others returned."

The official statement on Thursday's (May 16th) air fighting says:

"Great aerial activity prevailed on Thursday. Over twenty-five tons of bombs were dropped on important railway centres, aerodromes and billets behind the enemy lines.

"Aerial fighting was intense early in the morning and again in the evening, thirty hostile machines being destroyed and five driven down out of control. Ten were shot down by our anti-aircraft guns, two landing behind our line. Their occupants were captured. Five of our machines are missing.

"During the night ten and a half tons of bombs were dropped on different targets, including the railway stations at Lille, Douai and Chaulnes. Billets in the neighborhood of Bapaume, Peronne and Rosieres, as well as the docks at Bruges, were also bombed. The enemy's night flying machines were also active. One Gotha landed behind our line and its crew was captured."

The British announcement for May 18th reports successful bombing raids against Metz, Chaulnes, Doual, Thionville, and Marcoing stations. Nineteen hostile planes were shot down and four driven down out of control. Ten British machines are missing.

The official statement for May 19th reports the destruction of twenty-one German aeroplanes and the disabling of two others. Eight British machines are missing. Nineteen tons of bombs were dropped on Courtrai, Valenciennes, Roulers and Chaulnes; ten tons of bombs on Carcoing, Haulbourdin, Douai and Chaulnes stations, on billets near Bapaume and Bray, on the Solway works and lock gates at Zeebrugge. A British machine was lost.

The British Admiralty announced on May 13th that continuous bombing operations have been conducted from Dunkirk against Zeebrugge, which are described as follows:

"Several direct hits were obtained on the sheds on Zeebrugge mole, and a large shed at the seaplane base was completely burned. In the course of the offensive patrols six enemy machines were destroyed and two others were driven down out of control. One of ours is missing.

"On May 10 one of our seaplanes in the North Sea sighted a Zeppelin on patrol and an indecisive action lasting half an hour was terminated by the Zeppelin retreating to its base."

An official communication dealing with the operations in Palestine, issued May 16th, says:

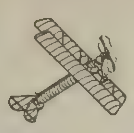
"On May 7th our aircraft executed a successful bombing raid on the Amman Railway Station and Hedjaz on the Hedjaz road, and on May 9th an enemy aerodrome and the railway station in the vicinity of Jenin were attacked by our air service."

ITALY

A squadron of Italian seaplanes and aeroplanes successfully bombed the Austrian submarine base at Cattaro, on the eastern shore of the Adriatic on May 13th, according to official advices from Rome.

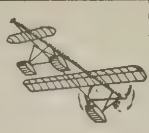
The Italian aerial offensive against Austrian naval forces again led to successful results on May 16th. Italian naval units, avoiding patrol boats and searchlights, succeeded in torpedoing an Austrian battleship of the Viribus Unitis type.

"Simultaneously," says the official announcement, "Italian seaplane squadrons attacked Austrian battleplanes over Pola, brought down two and forced several others down out of control. The Italian machines all returned safely to their bases."



MODEL NEWS

Edited by John F. McMahon



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Model Aeroplane Building as a Step to Aeronautical Engineering

WE are now ready to take up the power driven model. It is better to stop and consider what a power driven aeroplane is. In our glider we had nothing to worry about, but to throw it with sufficient force to keep it moving at the proper speed, when that speed dropped off it would come back to earth. The powered model is a little harder proposition to overcome, because the power thrust while in flight is pushing the machine through the air while the resistance is trying to hold it back. When the motor stops the power thrust is cut off and the centre of resistance moves to another point tending to throw the machine out of balance, as the accompanying drawings show.

A very easy way to study what action the aeroplane is under is to place a small box on a table in front of you, place the second finger of your left hand on the left side of the box and the right finger to the right side at points directly opposite each other. Now press firmly as if you were trying to force your fingers through the box and you find that the box stays stationary showing that the centres of thrust and resistance meet on the same line. Now should you slide the left finger higher we find after exerting pressure that the box turns over on its side showing that thrust and resistance do not coincide.

By referring to figures 1, 2, 3 and 4, we see by following the arrows how the action applies to the aeroplane. In figure 1, arrow A is the thrust, arrow B is the resistance. In order to correct the model from pointing its nose upward in flight, we would have to set the Elevators at a positive angle, but as soon as the power thrust stopped the model would lose its balance and point its nose to the ground, as shown in figure 2.

Figure 3 shows the model with power thrust high and resistance low. This condition would compel us to do just the opposite to what we had to do for the first case, and when the power is cut off the model has a tendency to dive upward.

Bearing this in mind we will now consider what kind of a model we will build.

The simplest of powered models is the rubber strand driven type. This is done by twisting the propeller reverse way until sufficient energy is stored up to allow the model a flight of at least 150 to 200 feet. We might remember that a large aeroplane is controlled in the air by the pilot, and if it should be thrown out of its course while in flight, he can quickly change it to normal, but the flying model is a different proposition as it must fly alone depending on the design and the ingenuity of the builder to adjust it at all times. We might also remember that a rubber strand tightly wound has more power immediately after the propeller is released than it has after the aeroplane has traveled a short distance, and after rubber winds out the model must make a graceful glide, showing us that in order to take care of all the changes that takes place, we must pay strict attention to correct design.

The ideal type of an aeroplane is shown in figure 5. It will be noticed that the centres of pressure or lift, resistance, thrust and gravity all meet at the same point. This allows the model to maintain its balance at all times whether flying under power or gliding, and we will pattern our models from this principle. *(To be continued)*

SERGEANT JOHN A. CRANE, of the 635th Aero Corps, sends in photographs and a complete description of a JN 4 Curtiss military type model, measuring 6 feet from tip to tip of the wings, or one-sixth actual size. Unfortunately the description arrived too late for this issue, but I intend to publish it later. The model is of good construction and should be interesting to readers of Model News.

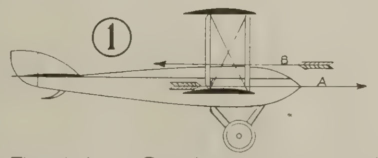
Sergeant Crane in his letter to me says, experiments with models have proven very instructive and interesting to him and others in the service, and he advises all model builders who wish to follow The Aero Corps, that they study model flight and construction thoroughly before enlisting, for their chances of promotion later.

I agree with Sergt. Crane but wish to put it stronger. I know that any young man who studys aeroplane flight through models and follows it up with engine driven models and later large machines, will pass his ground school course in half the time it takes the young man who has not done so.

For those who aspire to aviation honors in the service, I am prepared to answer any questions or give advice that might be needed by them.

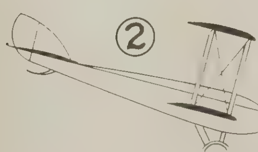
Would the Readers of Model News care to organize a body to be known as the "Junior Aeronautical Reserve" the object being the study of elementary Aeronautics to fit themselves for aviation work. Certain young men in each locality to club together and form units to conduct model contests, each unit to select a person who is more advanced in aeronautics, as Captain, and with my help to fit yourselves for better work. A good deal of this instruction work can be done by the Model Clubs now in existence. I would like to know what other model builders think of this plan.

①



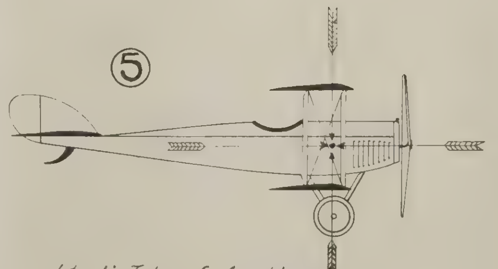
Thrust low. Resistance high, tends to throw Model on its tail

②



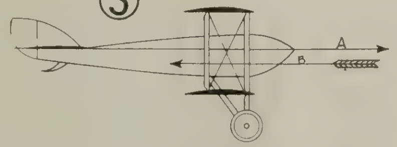
Position after power is cut off.

⑤



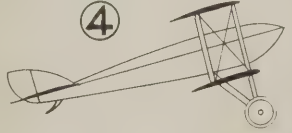
Ideal Type of Aeroplane. Arrows show Thrust, Resistance, Lift and Centre of Gravity all meeting at a predetermined point.

③



Thrust high, Resistance low. Tends to trip Model on its nose

④



position after power is cut off, when thrust is high.

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Note on the Natural History of Aeroplanes

The aeroplane swoops from crags of cloud
  To prey upon the Submarine;
Its hum is rather rough and loud;
  Its only drink is gasoline.

Some aeroplanes wouldn't heave a brick,
  But ride the blue on placid wings,
While others have a horrid trick
Of dropping nasty bombs and things.

While one prefers to navigate,
  With dignity, the azure vault,
Another cuts a figure eight
  Or throws a festive somersault.

They *never* flap their wings and crow;
  And sober aeroplanes quit the height
Of heaven when the sun is low
  To sleep in hangars over night.

Young bachelor aeroplanes love to roam
  The Great White Way that spans the sky;
But lady aeroplanes stay at home
  And teach young aeroplanes how to fly.

Arthur Guiterman.

On Eagles' Wings

(To the White Knights of the Air Services)

Supremely in His Hand are you,
To whom the mighty joy is given
On eagles' wings to climb the blue,
And, on the pinions of the winds,
To sweep the boundless plains of heaven.
So—to your minds
Be present this,
For cheer in your necessities,—

Who swings the countless spheres in space,
Yet to their even courses holds;
Who set the firmament in place
And its infinitudes unfolds,—
Come what come may of hap or chance,
He is your sure deliverance.

If but as Pilot by your side
He sits, upon Whose breath you ride,
He shall preserve you from alarms,
Spread wide His everlasting arms,
And bear you safely up on high
In His most noble company.

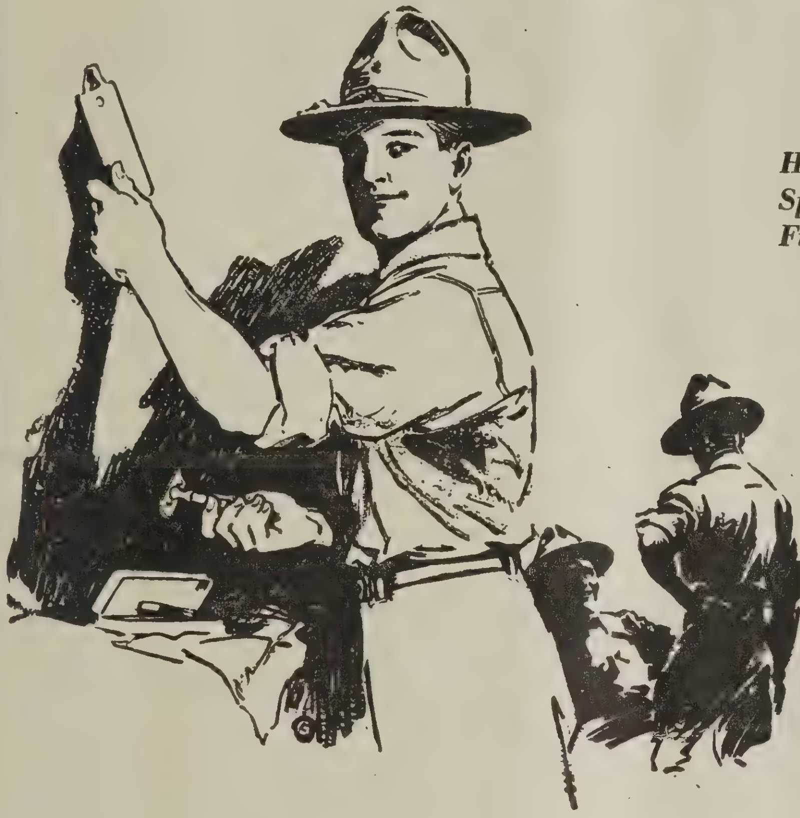
No sparrow falls but it is known
Of Him who sits on Heaven's high throne;
And you, in your supremest hour,
Shall feel the uplift of His power,
And know you not alone.

Alone? Alone?
None is alone!
For where is one,
There He is too.—
No man goeth alone!

Higher than most, to you is given
To live—or in His time, to die;
So, bear you as White Knights of Heaven—
The very flower of chivalry!
Take Him as your Pilot by your side,
And "All is Well!" whate'er betide.

Scenes in an Aircraft Factory. The Fire Brigade at Work. The blaze, as depicted by the artist of "The Aeroplane," which is seen consuming the propeller, is being combatted by a stream of hose, while the empannage of the aeroplane, so far out of reach of the lapping flames, is being detached, with a view to being removed from its precarious proximity to the flames.

Gillette
Safety
Razor



Have You Seen the New Gillettes Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

Hundreds of officers and men are buying them—the U. S. Service Set in metal case, and the new Khaki-covered sets for Uncle Sam's soldiers and officers.

The Gillette is the one razor for the man who is doing things — the one razor with world-wide use and reputation.

When a man wants new Blades he can get them at any Post Exchange or Y. M. C. A. Hut—here in America or Overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

No One Has More to Contend With in His Shaving than The Fighting Man

AND nobody knows better the bracing effects of a clean shave.

His shaving water may be cold, it may be hard, his skin wind-chapped or tender from sun-burn. Yet, on every Allied Front, and on every Allied battleship, he keeps himself clean-shaved—and he uses the Gillette Safety Razor.

The Gillette has solved and simplified every shaving problem put up to it by the boys in khaki or navy blue.

It has done service all over the map — from the deserts of Palestine to the icy spindrift of the North Sea — from Flanders to the remotest island in the East Indies — and has proved itself the real razor for service.

Complete, compact for the pack or the pocket — no strops or hones to clutter up the kit. Blades always sharp, always ready — and No Stropping — No Honing.

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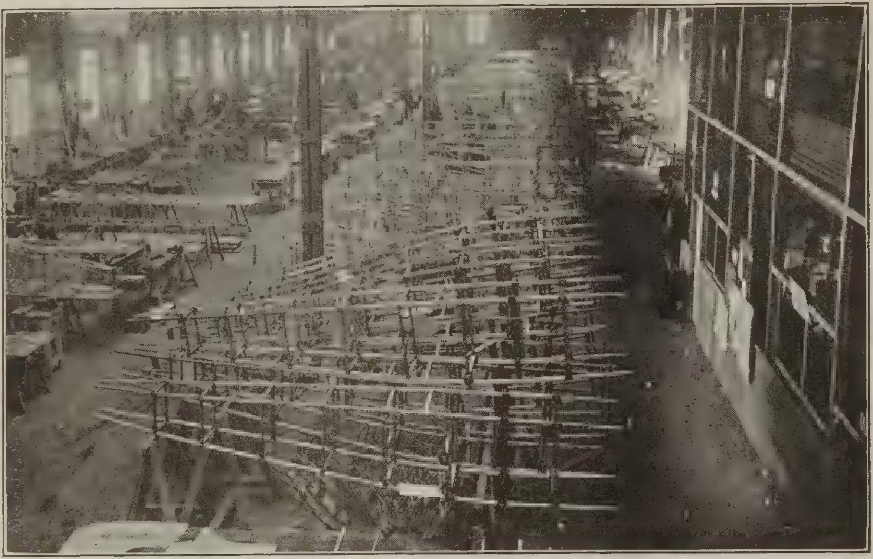

Every Cabinetmaker and Furniture Manufacturer in Europe is "doing his bit" for the air war by turning out aeroplane parts.

Mr. Cabinetmaker:

Are your spare lathes and turners and man-hours being devoted to the backing of Uncle Sam's Aircraft Program?

Ask our Contract Work Department how you can help.

AERIAL AGE WEEKLY, 280 Madison Ave., New York City

Advertising Builds up Good Will and Saves Taxes

(*Continued from page* 532)

There were 3,000 pieces of mail in the four sacks that were sent from New York. The first letter postmarked here was sent by Gov. Whitman to President Wilson in the interest of the Red Cross campaign. It will be auctioned for the Red Cross.

President Wilson Speeds Flier

The first aeroplane mail flight out of Washington started under the most auspicious circumstances and **with a "godspeed" from** the President of the United States, came to grief, when aviator George L. Boyle landed at Waldorf, Md., twenty-five miles southeast of Washington.

Lieut. James H. Edgerton, who brought the New York mail to Washington from the relay point at Bustleton, northeast of Philadelphia, made a perfect landing on the polo field in Potomac Park here at 2:50, just one hour and thirty minutes from Philadelphia.

President Wilson received a voluminous mail by the first aeroplane despatch. Mrs. Wilson too received a number of pieces.

Lieut. Boyle got away under ideal weather conditions. The President and a host of executive and legislative officials of this and other Governments witnessed the event which will be epoch making in American history.

The editorials on the aerial mail in the entire press of the country were most laudatory and congratulatory.

Aero Club Endorses Plan to Extend Aerial Service

Proposes Pittsburgh, Cleveland and Boston Routes

THE Executive Committee of the Aero Club of America has written to Secretary Baker and Assistant Postmaster General Praeger endorsing the plan to extend the aerial mail service and urging the extension of the service from New York and Washington to Pittsburgh and Cleveland and from New York to Boston.

The Club authorities point out that the tests have shown the absolute necessity of giving more extensive cross country flying training to military aviation students, and point out that by extending the aerial mail service, the students will have different routes to cover, which they can cover in turn, and thereby gain extensive experience in cross country flying.

In his letter to Secretary Baker and Assistant Postmaster General Praeger, Mr. Alan R. Hawley, President of the Aero Club of America, says:

"Nothing that has happened recently created more general public approval than the step taken to give cross country flying training to military aviators under the aerial mail plan, which necessitates their flying on schedule, and the plan to extend the service is creating most favorable comments.

"The first four days of aerial mail carrying between New York, Philadelphia and Washington have shown how absolutely necessary it is to give extensive cross country flying to our military aviators, so that they may be fully trained when they are sent overseas.

"This training should be continued until the aviators become so familiarized with the topography of the country that they will find it almost impossible to lose their way in flying during day or night.

"By extending the aerial mail service to Pittsburg and Cleveland, the character of the aerial mail service will assume much greater importance, both from the standpoint of the extensive cross country flying which it will afford to the military aviators and from the standpoint of the actual figures in time required for the delivery of mail to the manufacturing centers in the Middle West and West.

"The addition of an aerial mail route from Belmont Park to Boston is quite logical. This route will be one of the most efficient, because mail for New York and the North arrives at Belmont Park and the route from New York to Boston can be laid directly from that point. This route will also afford valuable training in cross country flying for our military aviators.

"This extension will permit the employment of the aerial mail for the delivery of orders and specifications for war materials, saving many hours each time in the delivery, thereby advancing the date of production accordingly.

"While the employment of the single motored aeroplanes will do until twin motored machines are available, we must look

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forward to the employment of twin motored machines for mail carrying purposes, as military aviators must be trained on twin motored machines for military purposes. Two-thirds of the aeroplanes employed for military purposes are equipped with two or three motors. The addition of one more makes it possible to fly both motors throttled down, thereby quadrupling the life of the motors. Needless to add that with a twin motored machine a pilot who misses the landing place can fly around until he finds it; and if anything goes wrong with one motor, he is not forced to land immediately, as one motor will keep the machine in the air until he has found the desired landing place."

(*Continued from page* 545)

V_c = oven-dry volume in cubic centimeters as found under C.

Reduction Factors

Multiply inches by 2.54 to obtain centimeters.

Multiply cubic inches by 16.4 to obtain cubic centimeters.

Multiply ounces by 28.4 to obtain grams.

Multiply pounds by 454.0 to obtain grams.

Method for Determining Volume

The volume of the sample can be found by determining the weight of water it displaces when immersed. This weight in grams is numerically equal to the volume of the specimen in cubic centimeters.

To determine the volume, therefore, a container holding sufficient water for the complete submergence of the specimen is placed on one pan of a balance scale. This container and water is then balanced with weights added to the other scale pan. By means of the sharp rod shown in the figure the specimen is held completely submerged and not touching the container while the scales are again balanced. This weight required to balance is the the weight of water displaced by the specimen and hence if in grams is numerically equal to the volume of the specimen in cubic centimeters. A diagrammatic sketch of the arrangement of this apparatus is given below.

Green sample.—Green samples can usually be immersed for volume determinations in the condition in which selected.

Air-dry samples.—The method of finding the volume by immersion is not recommended for air-dry material.

Oven-dry sample.—The oven-dry sample while still warm should be dipped in hot paraffine before being immersed for determination of volume. The oven-dry weight should, of course, be taken before the paraffine is applied. In addition, any surplus paraffine adhering to teh sample should be scraped off previous to immersion.

Points to Be Considered in Determining Specific Gravity

Size of sample.—The sample should be selected to contain from 5 to 25 cubic inches. Larger pieces require considerably more time for drying.

Weighing.—It is important that the determination of the volume by weighing be made as quickly as possible after the immersion of the specimen, since any absorption of water by the sample directly influences the accuracy of the result. By estimating the volume of the sample and placing approximately the required weights on the pan before the specimen is immersed, the time necessary for balancing may be reduced to a minimum.

Accuracy.—Both the oven-dry weight and the volume should be correct to within at least one-half per cent.

Drying.—The samples when placed in the oven for drying should be open piled to allow free access of air to each piece.

Since wood shrinks in drying the green volume will always be larger than the oven-dry volume. Consequently, for the same material the oven-dry specific gravity based on volume when oven-dry should be greater than the oven-dry specific gravity based on the volume at test.

By weighing the specific gravity specimen immediately after cutting as well as after oven-drying the moisture content can be computed, thus affording both moisture and specific gravity determinations on the same piece.

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TWIN MOTORED HARLEY-STROMER
AEROPLANES
HYDROAEROPLANES — FLYING BOATS

Standardized *As to*
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SAFETY
DURABILITY
PRICE
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Price $3,000

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Training Machine for the Student Aviator.
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If so our Educational Service Department can co-operate with you in helping you utilize your time to the best advantage by suggesting a course of aeronautic reading which will fit in with your

Ground School Studies

The Textbook of Naval Aeronautics, by Henry Woodhouse. **Price $6.25 postpaid.**

The Aeroplane Speaks, by Barber. **Price $3.25 postpaid.**

Learning to Fly in U. S. Army, Fales. **Price $1.60 postpaid.**

Aviation Engines, by Page. **Price $3.25 postpaid.**

Practical Wireless Telegraphy, Bucher. **Price $1.60 postpaid.**

Military Map Sketching and Reading, by Barnes. **Price $.85 postpaid.**

Glossary of Aviation Terms in French and English. Price $1.10 postpaid.

The Eyes of the Army and Navy, Munday. **Price $2.15 postpaid.**

Gas Engine Principles, by Whitman. **Price $1.70 postpaid.**

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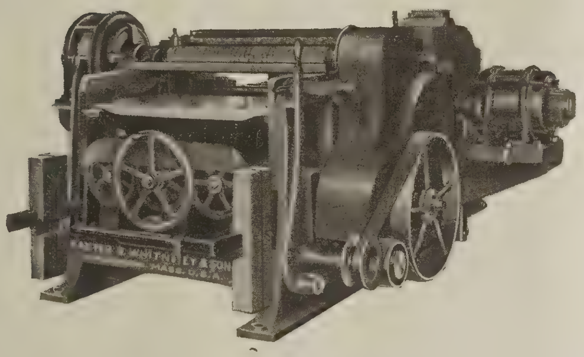

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Spalding, Henry J.	FLR
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Shaffer, Harvey Walter	SLR; PMT
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W

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Whitner, William Church, Jr.	SLR; FRF; DIK
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Westerhaus, Luther W.	DIK
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White, Lucien S.	PUP
Walker, Sherman P.	RTR
Wilson, William M.	RTR
Weisbach, Arthur H.	DIK
Wolcott, Henry N.	SLR
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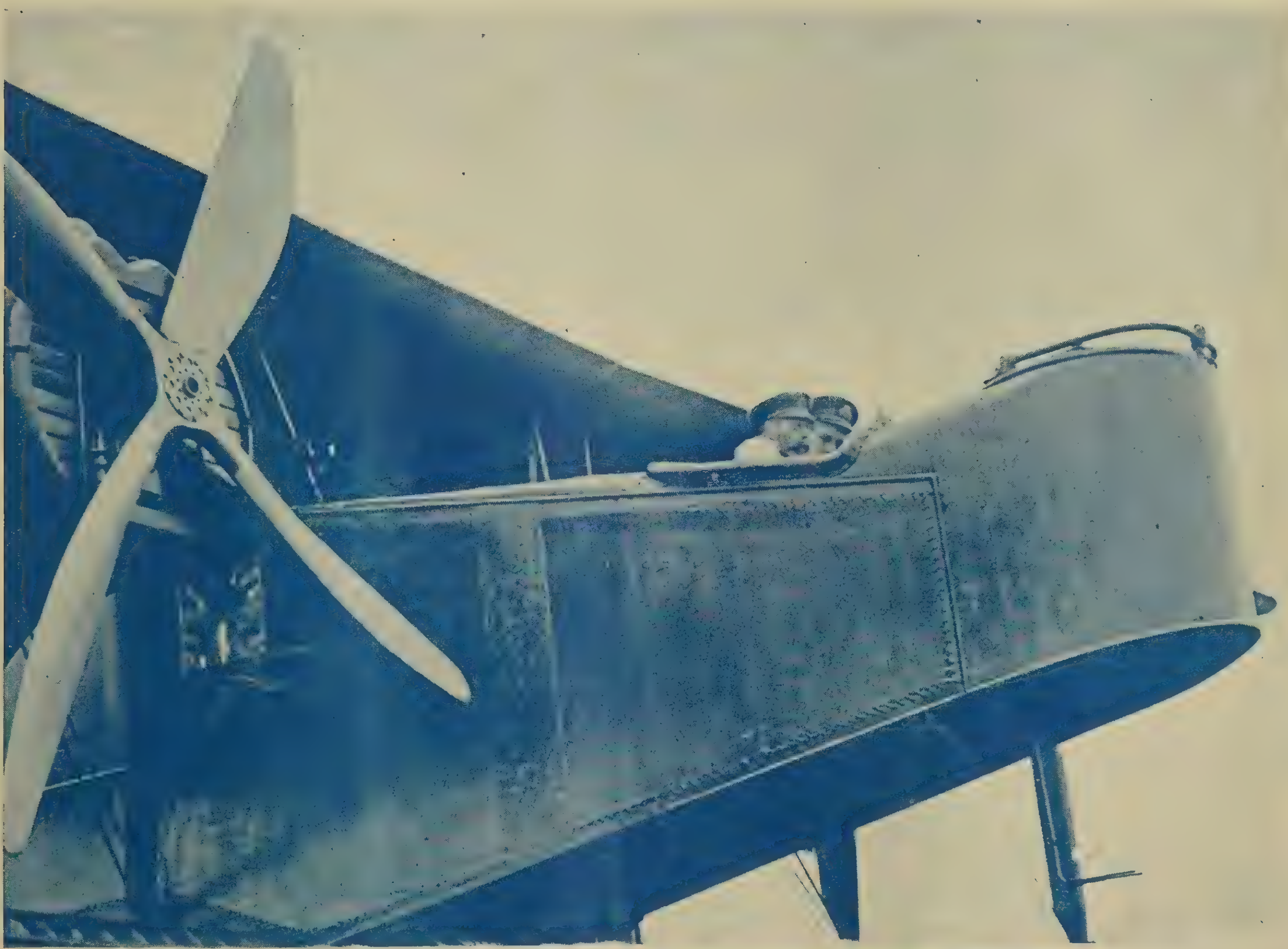

King George V about to make a flight in a Twin-Motored Handley-Page Biplane British Official Photo

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Drastic Development and Greater Utilization of Aircraft Urged by Painlevé

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VOL. VII NEW YORK, JUNE 3, 1918 No. 12

DRASTIC DEVELOPMENT AND GREATER UTILIZATION OF AIRCRAFT URGED BY PAINLEVÉ

PAUL PAINLEVÉ, former French Premier, has been elected President of the aviation group in the Chamber of Deputies, which comprises something like a third of the total membership of the House. This is a good omen for strong parliamentary support for a bold and extensive program of aeroplane construction, for which the country is now loudly calling.

M. Painlevé is no newcomer in aviation. He was one of Wilbur Wright's first passengers in 1908, and it was with him as a passenger that Wright set the record which he held so long for distance and duration flight with a passenger.

In the same year, while still a Deputy and Professor of Mathematics at the Sorbonne, M. Painlevé gave two lectures before the members of the Chamber and the Senate in which he called loudly for the immediate organization of aviation as applied to military purposes. In 1912, as reporter of the *Navy Budget,* he brought in the first demand for an appropriation for naval aviation and called for the development of the hydroaeroplane as an arm against the submarine.

He was one of the founders of the Government Superior School of Aeronautics, where he was a professor until he entered the Ministry in 1914. This school has been the birthplace of many of the leading French air specialists of the present time.

In an article in the *Petit Parisien* today M. Painlevé calls for a new and drastic development in the campaign for the greater utilization of the aeroplane in the present war. He says that it is all very well to talk about aviation deciding the supreme phase of the war, but to arrive at that end the present-day conceptions and plans must be enormously developed.

"We may not be able to crush Germany by mere artillery power," writes M. Painlevé, "although our artillery has nothing to blush for in comparison with the enemy's, but we have developed aviation to that stage where we can at least count on blinding the enemy's guns. The superiority of our aviation is undoubted, as the last few weeks have shown, but we must have legions of aeroplanes to multiply the victories we have already achieved.

"Why then do we not have these legions? The reason is not that we lack an abundance of clever and heroic airmen or suitable material for construction or that there are insoluble technical difficulties, for all these have been victoriously overcome. The real problem now is to decide whether to go on aiming at an incessant improvement of our existing machines or whether to select three or four well-known types and produce them in enormous numbers.

"Anybody who has considered the question will instantly reply: 'Let us, without losing an hour, turn out aeroplanes in masses. That is the only method that will enable us to develop that power of manufacture in series which is the secret to which American industry owes the prodigious intensity of its manufacturing effort.'"

To realize such a program, M. Painlevé calls for a complete pooling of ideas, experience, secrets, energy, and enthusiasm by the whole body of constructors of airplanes in all allied countries.

"They must place each other," he says, "in possession of the results of all their experiments, all their secrets. They must create in the most perfect form which our united knowledge allows the aerial army of civilization. The Allies have placed in common their men, their wheat, their gold. They must also place in common their knowledge, their inventive faculties.

"Industrial prosperity, trade-marks, and patents are things to be respected, but these must not be allowed to delay construction for war purposes for an hour. All these things count for nothing before the sacred cause. As we have created national union, let us create industrial union for aviation."

AMERICAN AVIATORS BEGINNING TO PARTICIPATE SUBSTANTIALLY IN AERIAL OPERATION

PRESS despatches during the past week have been emphasizing the participation of American aviators in aerial operations. Among the despatches published have been the following:

"An American Escadrille, composed of aviators chosen from among the best American pilots, in the future will help to defend Paris against enemy air raids.

"Offer of this help was made spontaneously by the chief of the American Aviation Service and accepted by the French Government through M. Dumesnil, Minister of Aviation."

Other despatches follow:

"Lieutenant Edward Rickenbacher, of Columbus, Ohio, has shot down his third enemy machine. The latest victory was achieved near Thiaucourt.

"An American aerial pursuit squadron is operating over the American sector northwest of Toul. All the pilots whose air exploits have been recorded up to this time belong to this squadron, which has a special insignia. The squadron is flying Nieuport chasing machines.

General Pershing's official communique of May 24th reports that "In Lorraine on May 21st a hostile aeroplane flying over our lines was disabled and forced to land in our own territory. There it was destroyed by our artillery fire adjusted with balloon observation."

"Lieutenant Edward Buford, Jr., of Nashville, Tenn., shot down a German aeroplane near St. Mihiel in a daring battle over the German lines. Buford was attacked by four enemy aeroplanes. He picked out one of the fliers and gave battle, who attempted to manoeuvre him into the center of the other German fliers. Buford, however, eluded them, quickly swinging homeward. One of the Germans tried to head him off with the result that he went crashing to earth.

"A dispatch from the American headquarters on the British front cabled by the Associated Press on May 25th, reports that four American aviators have been brought down over the German lines.

"The Cross of War was given to Lieutenants Walter V. Barneby, pilot, of Oklahoma, and Kenneth B. Culbert, observer, of East Orange, N. J., for their courage and skill on a trip over the enemy lines, which resulted in the death of both. They were making observations over an important sector of the German line when bombarded by powerful aircraft guns. Despite the heavy barrage, they completed their task, but in returning the crippled machine toppled to the ground when just over our lines."

1,316 American Aeroplanes Now Abroad, 3,760 Others at Home

A statement published in the press from the Military Affairs Committee of the House declares that there are now in France 1,316 aeroplanes of American manufacture, of which 323 are combat planes.

The statement from the committee also says that there are now completed in the United States 3,760 aeroplanes.

PLANE MAIL SUCCESSFUL—EXTENSION OF SERVICE BEING CONSIDERED

THE aerial mail service has justified its establishment, in the opinion of the Postoffice Department officials. The results achieved thus far have been entirely satisfactory, and a continuation of the service between Washington, Philadelphia and New York is assured.

Extensions of the service now are being planned, but no additional routes will be established until after difficulties experienced in the initial venture have been smoothed out. The Department now expects to start mail-carrying aeroplane between New York and Boston next fall. Later on the third route will be established between Chicago and St. Louis.

Six planes already have been purchased for the New York-Boston route, and a study of the weather conditions in New England now is being made. It is estimated that by arranging schedule so that planes from Washington will connect at New York with the Boston planes, mail from Washington could be delivered in Boston four hours earlier than by the railroads. The longer the route, the greater the saving in time as compared with the train schedules.

Unfavorable weather conditions have presented the most serious obstacles for the mail fliers to combat. Experts have been detailed to work out methods of overcoming difficulties encountered on foggy days. This obstruction to visibility is believed to be in a fair way to be completely offset.

The mail machines will be equipped with instruments for calculating wind velocity, driftage and other hampers to navigation. It also is planned to locate emergency landing fields every two or three miles over the entire postal routes. The advantage of these numerous landing sites will be that the fliers can sail along close to the ground.

Emergency landing fields between Washington and Philadelphia are being located this week. Next week this work will be continued between Philadelphia and New York. These stations are to be marked with a big white arrow, formed on the ground by putting down lime. A flier from Mineola, New York, to Washington this week picked out and made safe landings on eight available spots for emergency fields.

The powerful Liberty motors with which the mail planes are being equipped are expected to overcome most of the difficulties resulting from weather conditions, to reduce the flying time.

Two Liberty motored planes driven by Lieuts. Bonsal and Kilgore travelled from New York to Philadelphia in fifty-seven minutes. The best previous time for this flight was an hour and fifteen minutes.

The best time of flight between Washington and Philadelphia, made thus far, is an hour and twenty-nine minutes. This can be cut down considerably with a Liberty motor, it is said. But figuring on an hour and twenty-nine minutes between Washington and Philadelphia, the trip between this city and New York can be made in less than two hours and thirty minutes, which is half the time required for the trip by train.

Postoffice officials are confident the aerial service will be self-sustaining. Under the present arrangements whereby the War Department furnishes the fliers and machines and defrays the cost of upkeep, a profit is being turned in. The Postoffice Department merely supplies the landing fields and gasoline. But when the entire cost is put upon the Department, it is asserted the service will more than pay for itself.

To date an average of sixty letters have been carried northbound between Washington and New York, southbound aerial mail has been somewhat lighter. At the rate of twenty-four cents an ounce, the northbound mail brings in about $150 a day, which would aggregate approximately $50,000 annually. The southbound receipts would not fall far short of this amount, it is believed.

THE AIRCRAFT INVESTIGATION

IN a letter to Attorney General Thomas M. Gregory, the Charles E. Hughes, special appointee of the President, argues for an unhampered right of way for his investigation of the aircraft situation. The letter is as follows:

"My Dear Mr. Attorney General:—

"In accordance with your request I shall attempt to summarize briefly some of the points discussed in our conference to-day, particularly with respect to the scope of our inquiry.

"It is quite evident, from the material you have already gathered and from the matters discussed with you and Mr. Frierson, that it would be necessary for us carefully to examine all the activities relating to aircraft production. It is easy, of course, theoretically to distinguish between an inquiry within the province of the Department of Justice and one which is aimed merely at alleged waste, or neglect, or mismanagement, or inefficiency, apart from any appropriate basis for a civil suit to recover misappropriated moneys or a criminal prosecution.

(*Continued on page* 606)

THE ADVANTAGES OF SENDING MAIL BY AEROPLANE

Besides having great national defense values the Aeroplane Mail affords real efficient service. It is amazing to find that a person can post a letter in New York at 10.30 A. M. and have it delivered in Washington early the same afternoon—early enough to permit business men or officials to answer it the same day. The swiftness in delivering mail to New York, Philadelphia and Washington has a widespread effect on the mail delivering system, hastening delivery throughout the country.

Mail by aeroplane from New York, arriving at Philadelphia not later than 1.30 P. M., will connect with earlier trains than those conforming to train schedules for Atlantic City and Cape May; N. J.; Chester, Reading and Pottsville, Pa.; Wilmington, Del., and Port Deposit, Md.

Mail by aeroplane, arriving at Washington by 3.30 P. M., would make connections with the Baltimore & Ohio train leaving Washington at 4.00 P. M. for Cumberland, Grafton, Pittsburgh, Cincinnati, and St. Louis. It would also make connection with the Southern Railroad train leaving Washington at 4.15 P. M. for Charlottesville, Lynchburg, and Danville, Va.; Greensboro, Salisbury and Charlotte, N. C.; Atlanta, Ga.; Birmingham, Ala, and intermediate points.

Mail by aeroplane from Washington will connect at Philadelphia with earlier trains for Trenton, Atlantic City and Cape May, N. J.; East Stroudsburg, Chester, Reading, Pottsville, and Bethlehem, Pa., and Wilmington, Del., and intervening points.

Mail by aeroplane from Washington and Philadelphia, arriving at New York before 3.30 P. M., will make connections for Bridgeport and New Haven, Conn.; Springfield and Boston, Mass.; Albany, Syracuse, Rochester and Buffalo, N. Y.. Cleveland and Toledo, Ohio; Elkhart, Ind.; Chicago, Ill., and intervening points.

The fastest time between Washington and New York by train is 5 hours; by aeroplane, 2½ to 3 hours.

Mail can be sent by aeroplane from New York to any city which has mail connection with Philadelphia or Washington; from Washington to any city which can be reached by mail connection from Philadelphia or New York, and from Philadelphia to any city which can be reached through mail connections at New York or Washington.

(Signed) OTTO PRAEGER,
Second Assistant Postmaster General.

Washington, May 15, 1918.

THE NEWS OF THE WEEK

103 Aeroplanes Fly for the Red Cross

San Antonio, Tex.—A spectacular aeroplane display was given here on May 25th when 103 craft, piloted by men trained since the war began, took the air in an exhibition for the benefit of the Red Cross. Never before had so many aeroplanes flown together in America.

With Red Cross banners fluttering from the struts, the machines rose in winding single file. Rodman Law performed another record-breaking feat by dropping in a parachute from a machine 3,000 feet above the surface, surpassing his previous achievement by 500 feet. The machine from which he dropped was piloted by Edward Stinson, aviation instructor and brother of Katherine Stinson.

The battleplane formation of sixteen ships exemplified the development of that style of flying. The aviators showed wonderful control of their machines, and aero acrobatics were performed by the French instructor, Lievre, and Lieutenants Dorsett, Adams and Belser. Lieutenants Schaffer and Clayton engaged in a mimic air combat. The exhibition was witnessed by thousands, and a large sum was raised for the Red Cross.

Liberty Motor Speediest Aerial Mail Carrier

New York City, May 23rd—Lieutenant Stephen Bonsal carried the mail between Belmont Park and Philadelphia in the fastest time yet made for the trip in a Liberty motored mail carrying plane. He delivered the mail and returned in three hours, or about nineteen minutes better than any previous trip. Starting from New York at 11:30 a. m., the mail plane reached Philadelphia at 12:25, making the journey in 55 minutes. After loading and unloading the mail, he returned to New York, arriving at Belmont Field at 2.25, having covered the return trip in 50 minutes. The mail picked up at Philadelphia from Washington was delivered in New York 2 hours and 15 minutes after it had started from Washington.

Aerial Mail Aviators Face Rain and Hail

Washington, D. C.—The aviators in the Aeroplane Mail Service had their first rough experience with storms Monday, May 27th. Lieutenant Stephen Bonsal, Jr., leaving Belmont Field at 11:30 A. M. for Philadelphia, struck a severe electrical storm at an altitude of 1,200 feet and was lost to land. He skillfully rode against the storm, which was especially violent in wind and rain over New York and nearby New Jersey, but was forced to return to Belmont Field. As the storm grew severer, that part of the trip was abandoned and the mail sent by special courier to Washington on the train reaching there at 6:30 P. M.

Lieutenant James C. Edgerton had an exciting experience all the way from Philadelphia to Washington. He left Philadelphia at 12:30 P. M. in thick clouds and soon lost all trace of land. The postmaster at Elkton, Md., reported him passing over at 1:40 P. M., indicating slow progress against a head wind of twenty miles per hour. Between Havre de Grace and Baltimore, at an altitude of 10,000 feet, he struck a violent electrical storm accompanied by wind, rain, and hail. He pluckily continued right through the storm by compass, although the hail was pelting the plane and chewing the propeller, which had to be repaired at Washington. He passed out of the storm near Camp Meade, but had very cloudy weather until near Washington.

At an altitude of 10,000 feet, he began descent on a straight line just outside of Washington and made a beautiful landing at 3:04 P. M. His time from Philadelphia to Washington was two hours and thirty-four minutes, in comparison with one hour and twenty-nine minutes from Washington to Philadelphia on Monday.

Lieutenant Walter Miller, whose plane was damaged en route from Philadelphia to Washington Monday, came from Havre de Grace to Washington on his repaired plane Tuesday morning, arriving at 11:15 A. M., and immediately changed planes and left for Philadelphia at 11:30, arriving there at 1:22 P. M. Miller missed the storm.

Two of the powerful Liberty motors will probably be in operation on the mail aeroplanes before the end of the week which will be able to cope with these storm conditions.

"Planepost" Official Name for Aerial Mail

New York, N. Y.—According to a letter from Otto Praeger, Second Assistant Postmaster-General, to the *Evening Mail*, "planeposted" by "postplane," the word "planepost" has been adopted as the official word to designate the aerial mail service.

Rodman Wanamaker II, has just qualified at the Carlstrom School, Miami, Fla., for a pilot's certificate

100 Aero Mail Stamps Cost $20,000

Col. E. H. R. Green, son of Hetty Green, purchased for $20,000 a sheet of 100 of the new postal aeroplane stamps, but with the aeroplane turned up-side-down, through an error made by the Bureau of Engraving and Printing at Washington. These stamps were purchased for $24 in Washington by a discerning young man, who appreciated their philatelic value. He disposed of them to a dealer, who sold them to Mr. Green for more than 800 times their face value.

Building Huge Planes in England

Manchester, Eng.—Describing the war activities of the Birmingham district, a correspondent of the Manchester *Guardian*, writes that one of the largest carriage factories in the world is engaged in producing a new type of British bombing machine. This aeroplane carries four men as its ordinary crew, but can carry twenty men. Its speed is between seventy and eighty miles an hour and is said to have a carrying capacity equal to its own weight.

Liberty Motor Shipments

Washington, D. C.—According to an International News correspondent, American manufacturers are scheduled to ship 850 Liberty motors to British aeroplane factories before July 1st. A large Detroit factory will soon reach production of 100 motors per week. The total number of completed aeroplanes so far shipped abroad has not yet reached 50, although double this number has been produced and is awaiting shipment.

One of the large size bombs used by the British Air Forces. © Illustrated London News.

The item states that the American program calls for 120 aeroplane squadrons in France by January 1st. There being required for each squadron eighteen fliers and three machines for each flier, 6,480 aeroplanes would be required for such a schedule. In addition 88,128 ground men and 1,836 pilots, as well as observers, bombers and machine gun operators must be trained.

Katherine Stinson Flies from Chicago to Binghamton, 783 Miles

Binghamton, N. Y., May 23.—Katherine Stinson, who left Chicago on the morning of May 23rd with Government mail for New York, landed two miles north of Binghamton at 6.50 this evening. She met with an accident while attempting a landing, the machine turning turtle just as it reached the ground. The propeller was smashed and one of the wings damaged. Miss Stinson was uninjured.

Having covered the 783 miles from Chicago to this city in ten hours, Miss Stinson bettered the distance made by Ruth Law in her record-breaking flight in the fall of 1916 by about nine miles. She circled the city in search of a suitable landing place, and finally picked out a small plateau on a high hill north of the city. A strong wind added to the difficulties of the landing.

Columbus to Have Large Air Camp

Columbus, O., May 23rd.—The *Columbus Dispatch* announced that the War Department is to choose the location of one of the largest aviation training camps in the country from the vicinity of Columbus. It is stated that the State Fair Grounds will be offered to the Federal Government on condition that the National Dairy Show is not to be interfered with.

Augustus Post Addresses Municipal Engineers

New York City, May 22nd.—Augustus Post, honorary secretary of the Aerial League of America, addressed the Municipal Engineers of the city of New York on May 22nd. He vigorously defended the Government and the aeroplane program. The lecture was illustrated by slides and films, showing all phases of aerial warfare. In commenting on the aerial defenses of Paris, Mr. Post stated that he would not be surprised if an aerial bombing raid were to begin within fifteen minutes. "It would not be remarkable nowadays for a plane to cross the Atlantic, because longer trips have already been accomplished," he stated in the course of his remarks. Replying to a question regarding the "flying-tank," Mr. Post stated that the French have developed an aeroplane capable of carrying a 75 mm. gun.

Orville Wright Calls Armored Plane Useless

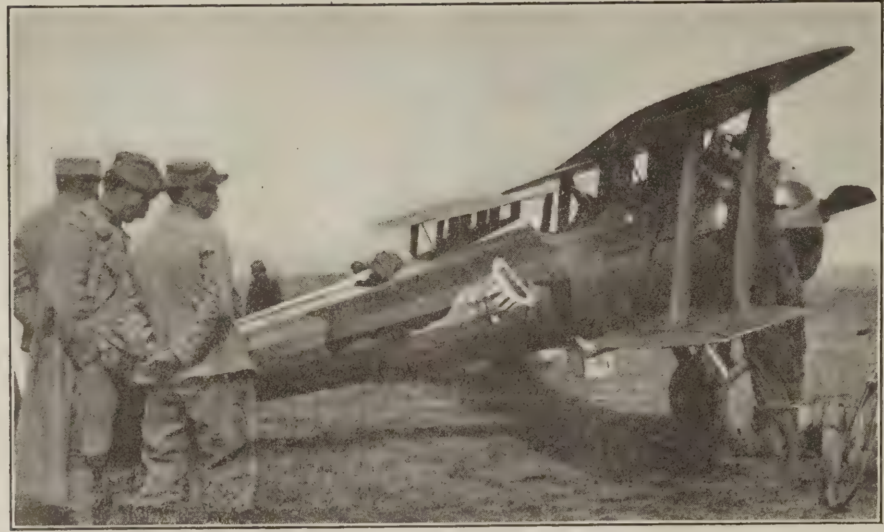
Dayton, May 22nd.—Orville Wright, when told of the "flying tank" which caused the death of Raoul Lufbery, is reported as saying: "It would not cause me to become panicky if the report were true. It would not be possible to use as heavy an armor as that without at the same time making the machine hard to manœuvre, thus taking from it one of the most vital and best features of a successful fighting plane. The usual armor of the machines that are armored at all is one-sixteenth of an inch, so you can readily see what weight this new machine, if the Germans really have one, is required to carry."

Atlantic City Wants Aerial Mail

Atlantic City, N. J.—Prominent business men, under the leadership of George F. Kerr, the manager of the Traymore Hotel, and with enthusiastic support of prominent visitors here, among whom is Augustus Post, the honorary secretary of the Aerial League of America, a movement has been started to have Atlantic City linked into the new sky postal service. The cosmopolitan character of the visitors here and the big field offered by the Boardwalk to advertise the service is expected to appeal to the Washington officials. Arrangements are already being made for landing places.

Detachable Fuel Tank for Aeroplanes

Toronto, Canada.—Mr. Lloyd Lott, for a short time with the Sheet Metals Products Co., Toronto, has invented an improved detachable fuel tank for aeroplanes. The moving of a lever throws the tank clear of the machine, whatever its position or angle. It is estimated that 75 to 80 per cent of aerial mishaps in active service are due to fire and explosion. The new device is an insurance against such accidents. While cutting off the tank, it provides for the feeding of the engine for a sufficient time for a safe descent from an emergency receptacle.



The aeroplane which Lieutenants Winslow and Campbell used in bringing down the first German aeroplane brought down by American forces

Convention of National Association of Manufacturers Held in New York

New York, N. Y.—Manufacturers from all sections of the country assembled in New York City to attend the twenty-third annual convention of the National Association of Manufacturers. Topics discussed included the conservation of man-power, problems of labor supply, mechanical reorganization, fuel, transportation, food economies, industrial housing, financial problems, rehabilitation of disabled soldiers and export trade developments.

Among the speakers will be Charles S. Page, of the United States Shipping Board; W. M. Nones, of the Norma Company, of New York; Lewis E. Pierson, of the Irving National Bank, of New York; Charles F. Beach, of Paris; N. B. Williams, of Washington; H. B. Van Sinderen, director of the Bureau of Exports at Washington; Ellis L. Howland, of New York; Major Harry E. Mock, and Dr. John Nolen, of Cambridge, Mass.

At the Aviation Training Centers

A large number of the members of the different aero squadrons will be going to the ground school at Urbana, Ill., from Chanute Field, Rantoul, Ill. Those enlisted men who have cherished the ambition to become aviators will be given a trial at the ground schools, if they pass the physical examination. It is stated that a majority of the ground men sent from Chanute Field have become full-fledged military aviators.

The Aviation Section of the Signal Corps of the Army now has twenty-nine flying fields. Most of them are regular service fields, where the graduates of the schools of military aeronautics, or "ground schools," receive their actual flying instruction, but some of them are reserved for advanced flying, experimental testing, and special training in bombing, artillery observation, etc. Camp Borden, at Toronto, Canda, is also used by the United States in conjunction with the British air force.

Aviation Assists the Red Cross Campaign

Atlantic City.—Aviators from this city, Philadelphia and Cape May bombarded the beach front with Red Cross literature, in order to aid the Red Cross drive.

Chicago, Ill.—Miss Ruth Law has given a series of exhibition flights in the Central Western States for the benefit of the Red Cross campaign.

German Aviators Apathetic

With the French Armies, May 25 (Cable to N. Y. *Times*).—"At the present moment German aviation is smashed flat. They react so little that I can hardly believe that they are not preparing something," said the commander of one of the most important French units, comprising observation planes, battle planes, and bombing planes. He continued:

"In all my experience I have never known the enemy airmen so devoid of energy and aggressiveness as during the last few days. There are scarcely any German planes on this front, and the hardest thing my battle planes have to do is to make the enemy put up a fight. It almost leads me to imagine that they have withdrawn their men to the interior for training with a new type of machine or in new manoeuvres. Yet at this moment, with a great battle impending, the work of the air service has particular importance, and it is hardly thinkable that any novelty, however radical, would justify the absence of airmen from active operations.

National Training Corporation Ground School Course Very Comprehensive

Detroit, Mich.—The National Training Corporation with a ground school in Detroit and flying field near Crosse Pointe, 15 miles distant, is offering a complete course of instruction in aviation, which follows somewhat the curriculum of the air service ground course. It occupies a period of eight weeks. The students are first given a week of theory, after which they spend a week in the cabinet shop, three days in the fabric shop, two and a half weeks in the erecting shop, three or four days in the copper and blacksmith shop, two and a half weeks in the motor shop and a week studying carbureters and magnetos. By this time the average student has a thorough knowledge of aeroplanes and is ready for flying training.

The flying course requires fifteen hours of flying time with the average student, cut up into periods of fifteen to twenty minutes. Then follows twenty to twenty-five hours of solo flying. He is then ready for his qualifying flights for a pilot's license. During the flying training, the student is given training in wireless telegraphy and map sketching.

V. C. Babcock, who was senior aviator in the U. S. service has prepared the entire course in the form of pamphlets and blue prints. W. W. Herne, formerly of the Royal Flying Corps, is a member of the instructing staff.

The school is now constructing a new hangar which will accommodate four machines. The tract of land is 1½ miles long and 500 feet wide. It is planned to build barracks and run them on military lines. No profits are expected from this source.

Copper Prices Not to Be Raised

Washington, D. C.—The price fixing committee of the War Industries Board will probably recommend to President Wilson that the present price of twenty-three and a half cents a pound for copper be continued for the three months beginning June 1st. Representatives of the copper industry have been agitating for a raising of the price, owing to increased labor costs.

INTERNATIONAL AIRCRAFT STANDARDS

By COKER F. CLARKSON

General Manager of the Society of Automotive Engineers.

THE American Aircraft Commission, which spent several weeks in Europe recently in conference with engineering representatives of the Allies, on the formulation of harmonious specifications of materials and mounting and other dimensions of parts for aircraft, was constituted of three representatives from the Society of Automotive Engineers, three from the International Aircraft Standards Board, two from the United States Signal Corps, and one each from the National Advisory Committee for Aeronautics, the Bureau of Standards, the United States Navy, The American Society of Mechanical Engineers, and the American Society for Testing Materials. The request that the various societies appoint delegates having been acted upon, the whole matter was referred to the Government, and the personnel of the Commission decided upon after consultation with representatives of Governmental manufacturing and engineering organizations.

The British Air Board (now the Air Council) had, in conjunction with the British Engineering Standards Committee (now the British Engineering Standards Association) formed a Sectional Committee to deal with the standardization of the components of aircraft and aircraft engines, and nominated several sub-committees to consider the details of the different branches of the subject. The British organization had been in communication with the French and Italian standardization committees.

The belief that the conferences just had would constitute a real advance, and facilitate ultimate international standardization, was borne out. The delegates had advisory powers only, the arrangement being that after conferring they would make recommendations to the authorities by whom they were appointed.

The members of the American Commission attended scores of sessions and conferences with their European brethren. Many aircraft and engine manufacturing plants were visited. Government factories, repair stations, laboratories and salvage depots were inspected and their methods studied. A formal International Conference was held in London, representatives of France, Italy, Great Britain and the United States being present. The general subject of co-operation of the Allied Powers, through exchange of ideas and standardization of aircraft materials, was discussed. All were in favor of a permanent aircraft standards organization representing at least five of the Allied Nations.

The following branches of the service and organizations of our Allies were represented in the conferences:

British—Technical Department of Aircraft Production and Aeronautical Supplies of the Ministry of Munitions, the Admirality, the National Physical Laboratory, the Aeronautical Society of Great Britain, the Society of British Aircraft Constructors, the Aircraft Steelmakers' Committee, the Technical Committee of Motor Industries Aeronautical Inspection Directorate, Brass and Copper Tube Association, British Electrical and Allied Manufacturers' Association, British Ignition Apparatus Association, Cable Makers' Association, ball-bearing manufacturers, the Weldless Tube Association, the Irish Power Loom Manufacturers' Association, the Iron and Steel Institute, and the Steel Research Committee.

French—Section Technique de l'Aeronautique and Service de l'Aviation.

Italian—Mission pour l'Aeronautique Militaire Italienne a l'Etranger, and Services d'Approvisionement de l'Aviation Italienne.

The prime objects of the conferences were to facilitate the sending of most usable supplies to England, France and Italy from the United States and to settle mutually satisfactory standards and specifications; to make parts, fittings and instruments interchangeable on aircraft produced in the different countries.

England and France and Italy, during the past three years, have worked with an energy never before equaled, and have made tremendous strides in aircraft design and production. The members of the American Commission were highly encouraged by what they saw. The spirit of co-operation in which they were met, the wholehearted expression of desire to work jointly to achieve the largest result toward the one thing worth considering today, were most gratifying.

The production of our Allies is now large. The work of their technical and scientific men in aircraft lines has been carried on in a very extensive and effective way.

Specifications for Steels

Progress was made at the conferences abroad in the formulation of Allied Standard specifications for aircraft steels, using the current American, British, Frenche and Italian specifications as a basis; covering both the general procedure for testing and the chemical and physical requirements of wrought steels.

Fabrics

The American standard fabrics have been submitted for test, and specifications have been recommended.

Dopes

The British specifications and methods of inspection were studied carefully. The science and economics of the manufacture of these articles are, of course, important.

Radial Bearings

In the metric sizes the S. A. E. and the British ball-bearing series are identical, except that six S. A. E. sizes have not been included in the British list. A revision of tolerances and limits recommended by the British and the American delegates is under consideration. Limits of eccentricity in radial bearings and outside dimensions of thrust bearings were other subjects of study.

Spark Plugs

The 18-mm. spark plug, incorporating the best features of the British and the S. A. E. plugs, has been recommended for use on American and British stationary cylinder and rotary engines. Practically the same plugs are used in France and Italy.

(*Continued on page* 601)

Commission Appointed to Test Browning Aircraft Gun

Washington, D. C.—A board of officers, consisting of Major Adlai H. Kilkenson, Signal Corps; Major Alfred H. Hobley, Signal Corps; and First Lieutenant Herbert O. Russell, Aviation Section, Signal Corps, is appointed to meet at Dayton, Ohio, for the ground test of the Browning aircraft gun at McCook Field, according to orders made public recently.

Gerard Urges Air Reprisals

New York, N. Y.—"The war should be brought home to the German people," said Mr. James W. Gerard, at the Church of the Ascension Forum on May 26th. "The Allies should conduct air raids against German towns." Mr. Gerard stated that no party of liberal tendencies exists in Germany today and that it is necessary for the German people to learn that those who live by the sword shall perish by the sword. And nothing can accomplish this so effectively as air raids.

Army Appropriation Bill Carries $14,300,000

Washington, May 22.—The Army Appropriation Bill which is to be placed before the House by the Military Affairs Committee carried the sum of $11,000,000,000, which is in addition to the regular army appropriation of $3,300,000,000. In addition to these sums, Secretary Baker asked for $1,500,000,000 for ordnance, together with authorization for the War Department to spend over $7,000,000,000 for the same purpose, if it is deemed necessary. The total of all these items is about $23,000,000,000.

The total number of officers in the army is given in the report at 140,133, while the total of men before the April draft call was 1,506,152. The drafts since that time carry the total of enlisted men slightly above 2,000,000.

There are 504,678 men in the regular army, the report said, 510,963 in the National Army, 411,922 in the National Guard and 78,560 in the Reserve Corps.

Huge Naval Appropriation

Washington, D. C.—The Senate added $202,840,000 to the House Naval Appropriation Bill, bringing its total up to $1,587,650,000. The bill provides for a personnel of 131,540 men, and the President is empowered to increase that number by 50,000.

The chief items of increase reported to the Senate are as follows:

Aviation, $32,340,150; ordnance and stores, $6,328,234; new batteries for ships, $45,000,000; ships ammunition, $34,500,000; torpedoes and appliances, $10,000,000, and most of the remainder to construction and improvement of naval bases and stations.

Crowell to Improve Army Organization

Washington, May 26th.—With a view to determining where more army red tape may be eliminated, Benedict Crowell, First Assistant Secretary of War, has inaugurated a thorough investigation into the office personnel and methods of the various War Department bureaus. The survey is being conducted by Colonel Ira L. Reeves, an infantry officer, detailed temporarily in the Inspector General's Department.

"The inquiry," said Mr. Crowell, "is intended to be of a constructive nature. No criticisms will be made unless accompanied by full recommendations as to an improved means of performing the work. It is intended to make changes of an evolutionary rather than a revolutionary nature. Reports are rendered from day to day of weak spots in the War Department organization, with recommendations that immediate steps be taken looking to their correction. The intention is that no general plan of reorganization shall be attempted, as such a plan would retard activities. The idea is to speed up, but to do it through the elimination, one at a time, of congested centres. Results are being expeditiously obtained, and it is believed that the survey already has resulted in increased efficiency, the speeding up of activities generally and the turning out of a greater amount of work with fewer employes."

Brigadier-General E. L. Ellington has been appointed Director-General of Military Aeronautics for the British Air Service

General Marieni, chief of the Italian Air Service

There has been very rapid expansion of the various bureaus of the War Department. At the outbreak of the war there were fewer than 3,000 employes on duty. The number is now approximately 25,000, an increase of 800 per cent. The increase in the army itself has been more than 1,500 per cent. The increase in personnel at the administrative end of the war has not kept pace with the growth of the military establishment.

Dayton-Wright Plant Plans 1,000 Production By August

Dayton, O.—The Dayton-Wright plant in Dayton, Ohio, has completed 107 aeroplanes since May 1st, according to a statement in the N. Y. *Evening Post*. The production figures for the De Havilland battleplanes from this plant are given as follows:

	Schedule	Production
May 1st to 4th	8	7
May 6th to 11th	24	29
May 13th to 19th	48	47
Total	80	83

It is stated that for every machine produced, 75 per cent in spare parts are shipped abroad. There are 32,840 parts to the two-seater fighting plane, fully equipped.

The Dayton company's schedule calls for 160 finished battleplanes in May, 324 in June, and 480 in July, or a total of 1,000 on August 1st.

In a test flight, one of the Dayton-Wright machines ascended to 10,000 feet in seven and a half minutes and attained a speed of 133 miles an hour.

Auto Production Curtailment Still Under Consideration

Washington, D. C.—Although it was widely announced in the press that a 75 per cent curtailment in the production of automobiles was planned by the War Industries Board, no official attempt has been made as yet to put such an order into effect. A committee of automobile manufacturers composed of W. C. Durant, General Motors Co.; John Willys, Willys-Overland Co.; John Dodge, Dodge Bros.; and Walter Flanders, Maxwell Motors Co., completed negotiations with the War Industries Board with the understanding that the Government will take steel and whatever other materials it needs up to 100 per cent, and the automobile manufacturers will arrange their programs accordingly. They will use their proportion of the steel that is left over pro rata with other non-war manufacturers. Each company has been advised by the committee to
The effects of such a drastic curtailment as
consider its production and program problems in view of this arrangement.
75 per cent have been feared by members of the industry, as it would completely disorganize huge organizations and financial disaster of a $2,000,000,000 industry. It would completely disrupt the business of 27,000 dealers. The new arrangement of the committee will permit of more gradual re-arrangement and re-adjustment of the industry.

War Trade Board Limits Exports

Washington, D. C.—The War Trade Board has issued a supplementary list to the export conservation list, which goes into effect immediately. This prevents the exports of antifriction babbit bearings, unless an integral part of a machine, rubberized silk suitable for use in manufacture of aircraft, unmanufactured artificial silk and spun silk, as well as numerous other articles, not used by the aircraft industry.

New British Incorporations

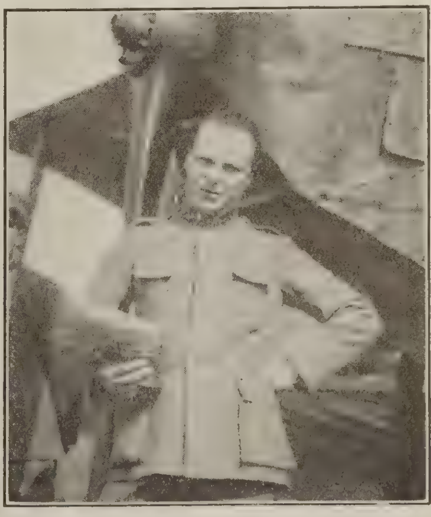
International Air Transport Co., Ltd., 34 Waterloo St., Birmingham. Capital, 2,000 pounds; Smith and Ewen, Ltd., 42 Frederick St., Birmingham. Capital 5,000 pounds, Aero Parts; Omegar Lampworks, Ltd. Capital, 1,000 pounds, Aircraft accessories; Samuel Groves and Co., Ltd., Musgrave Road, Soho, Birmingham. Capital 30,000 pounds. Aeroplanes and aeronautic fittings; Liverpool Gas Bag Manufacturing Co., 16, 18 Berry St., Liverpool. Capital, 1,000 pounds. Gas Bags; Oaklands Engineering Co., Ltd., 17 Basinghall St., E. C. 2, London. Capital, 1,000 pounds, Motor Cars and aeroplanes, dirigibles, etc.; Adastral, Ltd., Stanley Gardens, Hampstead, N. W. Capital, 5,000 pounds. Aeronautical engineers, manufacturers of motor.

Losses of German "Aces"

In connection with the report of the death in battle on the western front of Captain Baron von Richthofen, Germany's champion fighting aviator, the Berliner Zeitung am Mittag of April 24 printed a table showing that, of the forty-one German aviators who had brought down fifteen or more opponents since the beginning of the war, nineteen had fallen in action and two had been reported missing. The list of the fallen German fliers, together with the number of their victims and the year of their death follows:

Captain von Richthofen...........	80	1918
Lieutenant Boss	50	1917
Captain Boelcke	40	1916
Lieutenant Gontermann	39	1917
Lieutenant Max Muller	38	1918
Lieutenant Kurt Wolff............	34	1917
Lieutenant Schaefer	30	1917
Lieutenant Allmenroeder	30	1917
First Lieut. von Tutschek	27	1918
Lieutenant Bohme	24	1917
First Lieut. Bethge	20	1918
Lieutenant von Eschwege	20	1917
Lieutenant Frankl	19	1917
Lieutenant Wintgens	18	1916
Lieutenant Baldomus	18	1917
Lieutenant Hess	17	1917
First Lieut. Immelmann	15	1916
Lieutenant Dossenbach	15	1917
Lieutenant Schneider	15	1917

Lieutenant von Buelow, with twenty-eight victims, and First Lieutenant Dostler, with twenty-six, were reported missing.


Mr. Angy A. Uberti, of the Royal Italian Flying Corps, Special Correspondent of Aerial Age in Italy

The AIRCRAFT TRADE REVIEW

N. E. J.

Stearns Aero Parts Company Organized

Cleveland, O.—F. B. Stearns, chairman of the board of directors of the F. B. Stearns Co., is president and treasurer of the Stearns Aero Parts Co., recently organized in this city. It is stated that the new company is closely related to the F. B. Stearns Co., and its organization resulted from the desire of the latter to do experimental work.

Large Order for Aviation Trailers Placed

Corunna, Mich.—The Biggam Trailer Corp. is now in production on a Government order for 500 trailers for the Aviation Section.

New Metal Parts Firm

Detroit, Mich.—The American Metal Products Corp. has been organized here by Stephen Marossy, Frederick C. Matthaer and Roy H. Curtiss.

Moskovics Addresses Chicago Association of Commerce On Liberty Motor

Chicago, Ill.—Mr. F. E. Moskovics, vice- president of Nordyke & Marmom, addressed 1,500 members of the Chicago Association of Commerce on the Liberty engine. He pointed out the difficulties that had been encountered securing quantity production on the Liberty motor, and showed that the solution of those problems and the beginning of quantity production represented a tremendous step in advance.

Willys-Overland Has Four War Orders

New York City.—John N. Willys, at the annual meeting of the Overland directors, held at New York City, announced that the Willys-Overland Company, of Detroit, is now producing between 400 and 500 passenger cars a day, and is planning to manufacture a ¾-ton truck and also a larger model equipped with a Knight engine, in addition to its huge motor car production, amounting to between 400 and 500 cars a day, is working on four large war contracts. The British Government has contracted for 1,000 Sunbeam engines which are being built at the Toronto, Canada, plant of the company. An order for 5,000 Curtiss OX-5 8 cyl. training engines are being turned out at the Elmira plant. Gun carriages are being built at Detroit as well as a $10,000,000 shell order.

The company has already delivered more than half of the order for Curtiss engines, 835 being delivered in March and 1,003 in April. It is planned to deliver 1,000 engines in May and June.

Personal Pars

The first member of the present New York Legislature to join the country's fighting forces is Mitchell A. Tiahan, of Yonkers. He enlisted in the photographic division of the Aviation Section.

Ensign Leonard J. Buck, Aviation Corps, Naval Reserve Force, is engaged to Miss Beatrice Draper, of New York City. Ensign Buck is an alumnus of Lehigh University and is now stationed at Cambridge, Mass.

L. V. Spencer has joined the experimental station of the aviation section at Dayton and will have charge of all technical engineering information coming from that station. He was formerly Detroit representative of the Class Journal Company.

Frank Caulk, formerly of the Aluminum Castings Co., of Detroit, has been made sales truck manager of the Paige-Detroit Motor Co.

Schade with Gill Piston Ring

Mr. Herman P. Schade, President and General Manager of the Bearings Company of Pa., 684 No. Broad St., Philadelphia Pa., has retired from the company.

He is now president of the Chalsmith Sales Corporation of New York Eastern distributors for the Gill Piston Ring, Ball and Roller Bearings. Office 1864 Broadway, New York City.

Mayo Radiator Moves

To meet the increasing demand for its product and obtain improved shipping facilities, the Mayo Radiator Division of the Marlin-Rockwell Corporation moved its entire factory June 1st, from New Haven, Conn. to 143rd St. and Southern Boulevard, New York City.

Here a modern factory of 5 floors, with abundant light and air, occupying an entire city block, will provided for more than double their present capacity. Light, heat and power will be manufactured on the premises and every provision made for the health and comfort of employees. The additional room and arrangement of space enables the work to progress systematically from the top floor to the shipping department on the ground floor.

Easy access to the New York Central and the New York, New Haven and Hartford Railroads, including a spur track into the building, together with lighterage on the Harlem River, give exceptional advantages for the receiving and shipping of all material. This move has enabled the company to provide extensive new equipment and the machinery at New Haven will be quickly transported by motor trucks to the new location, thus preventing any delay on present production. With its usual far-sighted policy, the corporation has arranged for the removal of its employees to New York, and their loyalty is evident in their desire to remain with the company, thus insuring the prestige established for high-grade workmanship.

Mr. H. B. Gordon, General Manager, has recently appointed Mr. Richard Taylor as Sales Manager, with arrangements for an increased sales force and engineering department in keeping with the enlarged manufacturing capacity; Mr. L. A. Drake will continue to act as Factory Manager and have charge of the production at the new plant. Both domestic and export sales will now be handled from the new factory.

While continuing to manufacture the Mayo type of core which has proved the most efficient for aeroplanes, passenger cars, trucks and tractors, the new plant will also manufacture special radiators to customers' specifications and will do high-grade work

Interesting Fifth Avenue Window Displays, arranged by Strauss & Buegeleisen, of their famous Resistal goggles

PERSONNEL AND DIRECTORY OF THE WAR INDUSTRIES BOARD

THE following directory of the War Industries Board and its various divisions and sections has been issued by authority of the board as of date May 8, 1918:

War Industries Board.

- B. M. Baruch, chairman.—Branch 88, Room 909.
- Members:
  - R. S. Brookings.—Branch 153, Room 810.
  - Brig. Gen. P. E. Pierce.—Branch 32, War; Room 255, State, War, and Navy.
  - Rear Admiral F. F. Fletcher.—Branch 156, Room 711.
  - Hugh Frayne.—Branch 98, Room 706.
  - Judge Edwin B Parker.—Branch 60, Room 1009.
  - George N. Peek.—Branch 111, Room 59.
  - J. L. Replogle.—Branch 197, Room 1110.
  - L. L. Summers.—Branch 19, Room 211.
  - Alexander Legge.—Branch 237, Room 908.
- H. P. Ingels, secretary.—Branch 149, Room 701.
- W. W Phelps, assistant secretary.—Branch 125, Room 719.

Price Fixing Committee.

- Robert S. Brookings, chairman.—Branch 153, Room 810.
- Members:
  - B. M. Baruch.—Branch 88, Room 909.
  - Hugh Frayne.—Branch 98, Room 706.
  - H. A. Garfield.—Branch 161, Fuel Administration.
  - Brig. Gen. P. E Pierce.—Branch 32, War; Room 255, State, War, and Navy.
  - Lieut. Col. F. S. Young.—Branch 128, Room 709.
  - Commander John M. Hancock.—Bureau of Supplies.
  - W. B. Colver.—Federal Trade Commission.
  - Dr. T. W Taussig.—Tariff Commission.
- H. P. Ingels, acting secretary.—Branch 149, Room 701.

Labor Division.

- Mr. Hugh Frayne, chairman.—Branch 98, Room 706.

Allied Purchasing Commission.

- James A. Carr, business manager.—Branch 238, Room 905.
  - James C. Leddy.—Branch 59, Room 912.
  - F. E. Penick.—Branch 186, Room 913

Requirements Division.

- Alexander Legge, chairman.—Branch 237, Room 908.
- Members:
  - B. M. Baruch, ex officio.—Branch 88, Room 909.
  - Judge Edwin B. Parker, priority.—Branch 60, Room 1009.
  - George N. Peek, finished products.—Branch 111, Room 59.
  - J. Leonard Replogle, steel.—Branch 197, Room 1110.
  - L. L. Summers.—Branch 19, Room 211.
  - Pope Yeatman.—Branch 14, Room 813.
  - Col. George H. Estes, Army representative.—Branch 3092, War.
  - Capt. M. N. Taylor, Navy representative Construction Division.—Branch 118, Navy.
  - Admiral C. J. Peoples, Navy representative.—Branch 48, Navy.
  - J. L. Ackerson, Emergency Fleet representative.—Branch 27, Shipping Board.
  - T. F. Whitmarsh, Food Administration representative.—Branch 222, Food Administration.
  - M. B. Poole, Red Cross representative.—Branch 417, Red Cross.
  - T. C. Powell, Railroad Administration representative.—Branch 67, Council.
  - Jas. A. Carr, representing the allies —Branch 237, Council.
- James Ingles, executive secretary.—Branch 203, Room 56.

Finished Products Division.

- George N. Peek, director of finished products.—Branch 111, Room 59.
- E. L. Crawford, assistant commissioner.—Branch 152, Room 808.
- Stanley Williamson, assistant.—Branch 61, Room 807.

Stored Materials Division.

- J. F. Wilkins, Chief.—Branch 174, Room 1215.

Statistical Division.

- Mills E. Case, acting director.—Branch 105, Room 16.

Priorities Division.

- Judge E. B. Parker, priorities commissioner.—Branch 60, Room 1008.
- Charles K. Foster, assistant to the commissioner.—Branch 175, Room 1010.
- Maj. Gen. J. B. Aleshire, any work other than ordnance.—Branch 92, Room 1007.
- George Armsby, agricultural implements, food products and containers, mining equipment, pig tin, tin plate.—Branch 96, Room 1005.
- H. H. Barbour, iron and steel products; subcommittee on rating.—Branch 79, Room 1016.
- Capt. F. E. Clark, coordinating member representing Navy.—Branch 156, Room 713.
- E. L. Crawford, coordinating member representing finished products division.—Branch 152, Room 808.
- Col. W. W. Gibson, ordnance for United States Army —Branch 200, Room 1012.
- C. P. Howland, Emergency Fleet, controversies growing out of the issuance of priorities certificates.—Branch 74, Room 70.
- Rear Admiral N. E. Mason, ordnance for United States Navy.—Branch 50, Room 1014.
- Everett Morss, copper, wire rope, woolen and cotton goods, tubing, etc.—Branch 271, Room 1002.
- Lucius P. Ordway, oil-well and gas-well machinery, abrasives, lumber, etc.; subcommittee on rating.—Branch 142, Room 1017.
- T. C. Powell, railroad equipment and supplies; representative of the Railroad Administration; transportation.—Branch 67, Room 62.
- Lieut. Col. F. S. Young, coordinating member representing Army, General Staff.—Branch 312, Room 708.
- Rear Admiral A. V. Zane, Navy work other than ordnance.—Branch 7, Room 1013.
- F. H. Macpherson, chief of bureau of application and issue, investigation, and research.—Branch 63, Room 66.
- Maurice Hirsch, secretary to the committee.—Branch 5, Room 1011.

Priorities Board.

- Judge E. B. Parker, priorities commissioner.—Branch 60, Room 1008.
- B. M. Baruch, chairman of the War Industries Board; is ex officio member of this board and presides over its deliberations when in attendance on its meetings.—Branch 88, Room 909.
- Edward Chambers, director of traffic, United States Railroad Administration, Interstate Commerce Commission Building.
- Admiral F. F. Fletcher, United States Navy.—Branch 156, Room 711.
- Alex. Legge, representing the allied purchasing commission.—Branch 237, Room 719.
- P. F. Noyes, director of conservation, United States Fuel Administration.
- Gen. Palmer E. Pierce, United States Army.—Branch 32, War, Room 255.
- Charles R. Piez, vice president and general manager of the Emergency Fleet Corporation (representing the United States Shipping Board and Emergency Fleet Corporation).
- Clarence M. Wooley, member of the War Trade Board.
- H. G. Phillipps, secretary.—Branch 272, Room 1101.

Commodity Sections.

- Agricultural implements, animal and hand drawn vehicles, and wood products:
  - E. E. Parsonage, chief, Branch 205, Room 102.
  - P. B. Schravesande, assistant, Branch 205, Room 102.
  - Col. W. S. Wood, Army representative.
  - Maj. Seth Williams, Marine Corps representative.
- Automotive products section:
  - H. L. Horning, chief, Branch 250, Room 111.
  - H. J Adams, assistant, Branch 3, Room 111.
  - E. J. Hickey, Branch 3, Room 111.
  - Coker F. Clarkson, engineering matters, Branch 250, Room 111.
  - Paymaster Howard S. Fisk, representing the Navy, Branch 351, Navy.
  - Lieut. Col. J. W. Furlow, Army representative.
  - Maj. Seth Williams, Marine Corps representative.
- Brass and copper tubing:
  - Everett Morss, chief, Branch 271, Room 1001.
  - G. R. Jasper, Emergency Fleet representative.
  - Maj. Seth Williams, Marine Corps representative.
- Building materials section:
  - Richard L. Humphrey, chief, Branch 56, Room 815.
  - S. I. Marks, acting pay clerk, representing the Navy, Branch 22, Navy.
  - Capt. J. J. Mills, representing the Army, Lincoln 5200, Branch 320.
  - Maj. Seth Williams, Marine Corps representative.
- Chain section:
  - John C. Schmidt, chief, Branch 310, Room 58.
  - Arthur E. Crockett, assistant.
  - Lieut. Commander Fuller, representing the Navy, Branch 41, Navy.
  - J. P. Bourke, representing the Emergency Fleet Corporation.
  - Capt. Batcheller, representing the Army, Branch 54, North 9985.
  - Maj. Seth Williams, Marine Corps representative.
- Chemicals and explosives section:
  - L. L. Summers, chief, explosives, Branch 19, Room 211.
  - Charles H. MacDowell, assistant, nitrates, Branch 258, Room 210.
  - J. H. Adams, mica, Branch 3, Room 211.
  - Albert Brunker, acids and heavy chemicals, Bureau of Mines.
  - R. S. Hubbard, acids and heavy chemicals, Bureau of Mines.
  - A. E. Wells, acids and heavy chemicals, Bureau of Mines.
  - C. H. Conner, wood-distillation products; platinum commandeering; requisitioning.—Branch 55, Room 55.
  - E. J. Haley, tanning materials, greases, tallows, vegetable oils, and waxes.
  - J. M. Morehead, coal, gas products (benzol, toluol, etc.), rare gases; nitrogen, oxygen, etc.—Branch 18, Room 213.
  - Ira C. Darling, toluol distribution, etc.
  - A. G. Rosengarten, fine chemicals.
  - H. W. Sanford, manganese, chrome, etc.—Branch 292, Room 208.
  - Robert M. Torrence, glass; chemicals, carboys, chemical stoneware.—Room 209.
  - Wm. G. Woolfolk, brimstone, pyrites, etc.—Bureau of Mines.
  - Dr. H. R. Moody, consulting staff, inorganic chemicals, electrolysis, electrometallurgy, ceramics and refractories, organic compounds, and dyestuffs.—Branch 216, Room 215.
  - Dr. Samuel A. Tucker, consulting staff, inorganic chemicals, electrolysis, electrometallurgy, ceramics and refractories, organic compounds and dyestuffs.—Branch 291, Room 215.
  - Dr. E. R. Weidlein, consulting staff, inorganic chemicals, electrolysis, electrometallurgy, ceramics and refractories, organic compounds and dyestuffs.
  - Maj. Seth Williams, Marine Corps representative.
- Navy representatives—
  - Donald Riley, alcohol, explosives, nitrates, alkalies, chlorine, electro-chemicals, dyestuffs, and organic chemicals.
  - S R. Fuller, manganese, chrome, ferroalloys.
  - C. K. McDonalds, mica.
  - S. I. Marks, tin, including pig tin and tin plate.
  - C. M. Morford, lumber.
- Army representatives—
  - Capt. Gelschen, alcohol, nitrates, alkalies, chlorine, acids, sulphur, and pyrites.—Branch 590.
  - Mr. Lockhart, wood distillation products, platinum, and formaldehyde.—Lincoln 5200, Branch 25.
  - Charles Rice, electrochemicals, dyestuffs, and organic chemicals.—Branch 2751.
  - Lieut. Col. Spruance, explosives and nitrates.—Branch 936.
- Conversion of industries:
  - E. F. Bulmann.—Room 58.
- Crane section:
  - Alexander C. Brown, chief.—Branch 196, Room 104.
  - L. P. Lipps, assistant.—Branch 196, Room 104.
  - Capt. L. E. Stamp, assistant chief section.—Branch 196, Room 104.
  - Capt. W. W. Houston, Army representative.
  - G. G. Green, Navy representative.
  - Maj. Seth Williams, Marine Corps representative.
  - H. L. Lewis, Emergency Fleet Corporation representative.
- Electric and power equipment section:
  - Walter Robbins, chief.—Branch 113, Room 112.
  - L. W. Grothaus, assistant.—Branch 113, Room 112.
  - M. M. Hughes, assistant.—Branch 114, Room 112
  - A. L. Bell, representing the Emergency Fleet Corporation.
  - W. R. McCann, representing the Emergency Fleet Corporation.
  - Thos. B. Adams, representing the Emergency Fleet Corporation.
  - Maj. L. B. Miller, Engineer Corps.
  - Lieut Col. C. N. Black, Ordnance Department.—Main 2570, Branch 478.
  - Lieut. Col. A. C. Christie, Medical Department.
  - C. J. Katzenstein, Bureau of Supplies and Accounts, Navy Department.
  - H. R. Stuart, Signal Corps.
  - Maj. Seth Williams, Marine Corps representative.
- Emergency construction committee:
  - Col. W. A. Starrett, chairman.—Branch 112, Room 503.
  - Capt. K. M. Murchison.—Branch 154, Room 503
  - Maj. C. Foster.—Branch 167, Room 503.
  - Capt. A. H. Granger, Branch 8, Room 503.
  - Lieut. J. B. Talmage.—Branch 212, Room 503.
  - W. F. Long, assistant section chief.—Branch 212, Room 503.
  - F. L. Olmsted.—Branch 212, Room 503
  - John Donlin.—Branch 212, Room 503.
- Fire-prevention section:
  - W. H. Merrill, chairman.—Branch 1166, War.
  - Frank L. Pierce.—Branch 1166, War.
  - W. E. Mallalieu —Branch 1166, War.
  - Geo. W. Booth, secretary and associate chief of section.—Branch 1166, War.

(*Continued on page 603*)

THE LAWSON M. T. 2 TRACTOR BIPLANE*

THE Lawson M.T.2 tractor biplane constructed by the Lawson Aircraft Corporation, of Green Bay, Wis., has a number of interesting changes and improvements on the Model M.T. described in AERIAL AGE for October 1, 1917. We are indebted to the company for the following facts:

The characteristics of the M.T.2 are approximately as follows:

Span upper plane	39′
Span lower plane	36′
Chord	5′2″
Gap	5′1″
Stagger	8″
Aera, upper plane (including ailerons)	200 sq. ft.
Aera lower plane	150 sq. ft.
Length, over all	25′
Height, over all	8′
Weight, empty	1,200 lbs.
Weight, loaded	1,900 lbs.
Speed range	42-90 M.P.H.
Climb, in 10 minutes	6,000 ft.
Gliding angle, full load	1 in 9
Motor, Hall Scott	100 H.P.

Planes

Both wings are in two sections, the top attaching by hinges to hinge plugs secured in the cabane and the lower to plugs secured to fittings and cross tie tubes in the fuselage.

The spars are of 1 section, having a high factor of safety (which incidentally is carried throughout the machine on the more important parts). They are left solid at both internal and external strut attaching points and also wherever any bolts attach such as for the wing and aileron hinges The ribs themselves are built of wood webs, reinforced with strips between lightening holes, and cap strips. Mahogany veneer forms the nose of the upper surface of both wings while false ribs are placed between the standard ribs from the entering edge to the front spars.

Between spars the ribs are braced by stringers while bays are separated by square section struts channeled out.

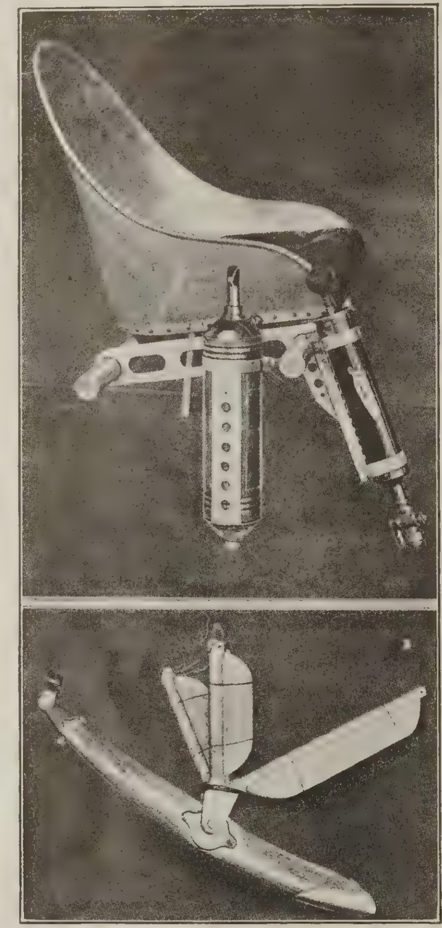
Double wiring takes all drift strains while single is used for truing up. These wires are given two heavy coats of red lead while all woodwork is given a coat of filler and a coat of varnish.

The trailing edge is ash, excepting at the inner ends of the wings and outer ends of the ailerons where flattened steel tubing is used. The outer edges are of steambent white ash and silghtly curved in plan view to take the tensional pull of the cloth caused through the contraction of the wing dope upon its application.

Both wings are connected by two pairs of interplane struts on each side of the fuselage. These taper into cup sockets which are fastened to the wing strut plates by a neat bolt and nut. The plates themselves are of the four bolt type whereupon the bolts clamp the spars and are prevented from sliding by blocks attached to the latter.

The lift cables are all doubled and are all of ⅛ cable with the exception of the main lift and main landing wires, these being 5/32.

The ailerons work in conjunction with each other, being interconnected by cable guided through neat fairleads on top of the upper wing. Each is equipped with two sets of brace arms provided with shackles to take both brace and control cables. The control cables run through pulleys down to the fuselage where they connect to a chain and are safetied to each other as well.



Details of the Lawson M. T. 2 tractor

Fuselage

The longerons and vertical struts are of straight grain ash in front and spruce in the rear. The longerons are left solid their complete length, while all struts, both vertical and horizontal, have been channeled but left solid at all points of connection. Steel tubes fitted into sockets are used for horizontal struts back to the rear pit and also to carry the load from the tail skid shock absorbers.

Owing to the constant section of both longerons and struts in the rear part of the fuselage the fittings are all standard and can be used at any of the stations in this section. The stern post is of tubing with interchangeable fittings at upper and lower ends to take the longerons. Each pit is reinforced with ash rims as well as the tension wires to prevent any twisting effect caused by rapid manoeuvering either on the ground or in the air and it likewise acts as a protection in case of a "telescoping" landing. The whole fuselage is braced throughout by double cables in the front sections and wire in the rear

The engine bed rails rest on top of an ash cross-member and are secured to this by U-Bolts. The whole unit is braced by tubes fitted with plug ends which bolt directly to the bed and fuselage fittings in such a manner as to entirely eliminate all wire bracing.

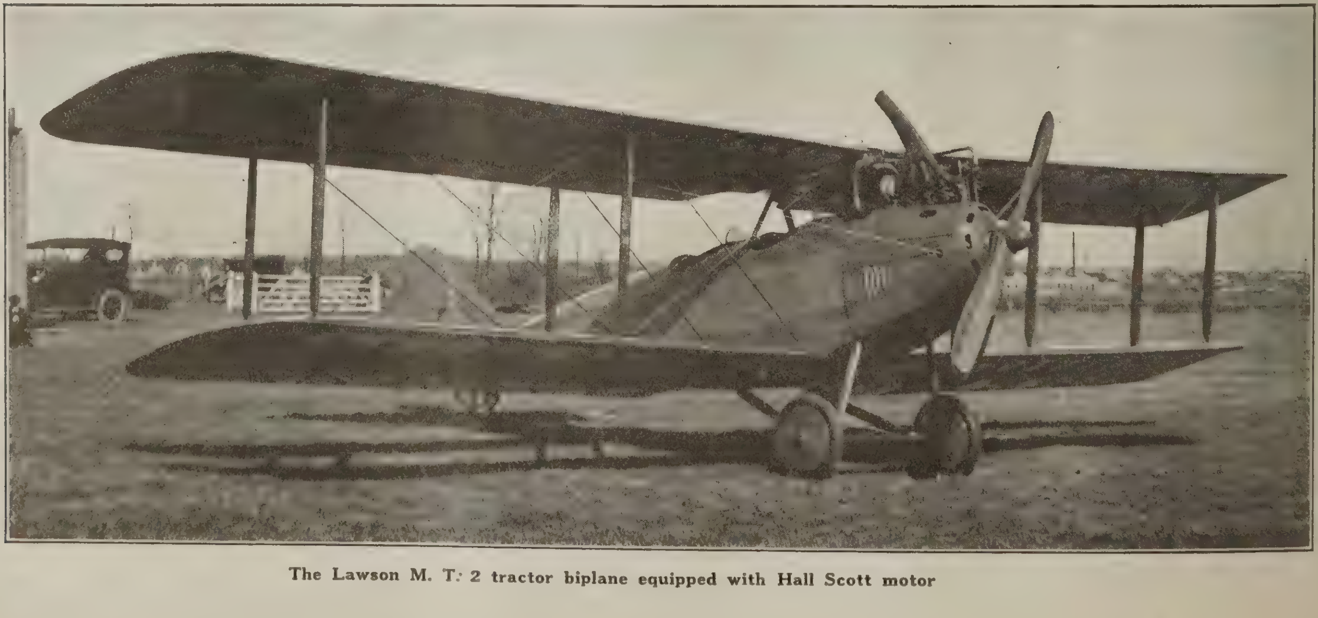
It may be mentioned here that no flattened end tubes are used whatsoever throughout the whole machine. Plugs are used of the flattened, forked or male type and these are driven into each end of the tube and securely fastened. The extreme simplicity may be imagined what this means for quantity production as well as the quick assembly of these parts.

Dual control is used while either are made demountable for any purpose intended. The control grips are mounted on steel tubes which in turn, are connected together by a connecting tube. The grips are of aluminum alloy castings with hard rubber hand holds grooved out for better gripping. These are bolted to the grip arms which extend outward and backward, making the general appearance similar to the hilt of a sword. The lower ends of the control columns are connected to a main rocker shaft, mounted in large bearings on the floor. Directly under the front seat a sector with two grooves is mounted which carries two chains connecting to the aileron control cables.

Just in back of the rear pit and mounted on the seat rails is a cross rocker shaft which is equipped with a contilever lever connecting to the rear control, by means of a universal point, and two elevator rocker levers to which the control cables are secured by a universal attachment.

M.T.2 is equipped with the usual complement of instruments, including respirators for ceiling or altitude work and also is equipped to use or not to use the Lawson Detachable Heating Arrangement, and alongside of each seat are Pyrenes mounted in brackets and within easy reach. These are connected to tubes running forward to the motor section and flooding that section around the carburetor and gas tank in case of fire.

In front of the front pit and on top of the longerons a gas tank holding two hours' fuel is mounted. It is provided with shut-off, hand and mechanical air pump intakes as well as a large filler cap, air release valve and capacity gauge.



The Lawson M. T. 2 tractor biplane equipped with Hall Scott motor

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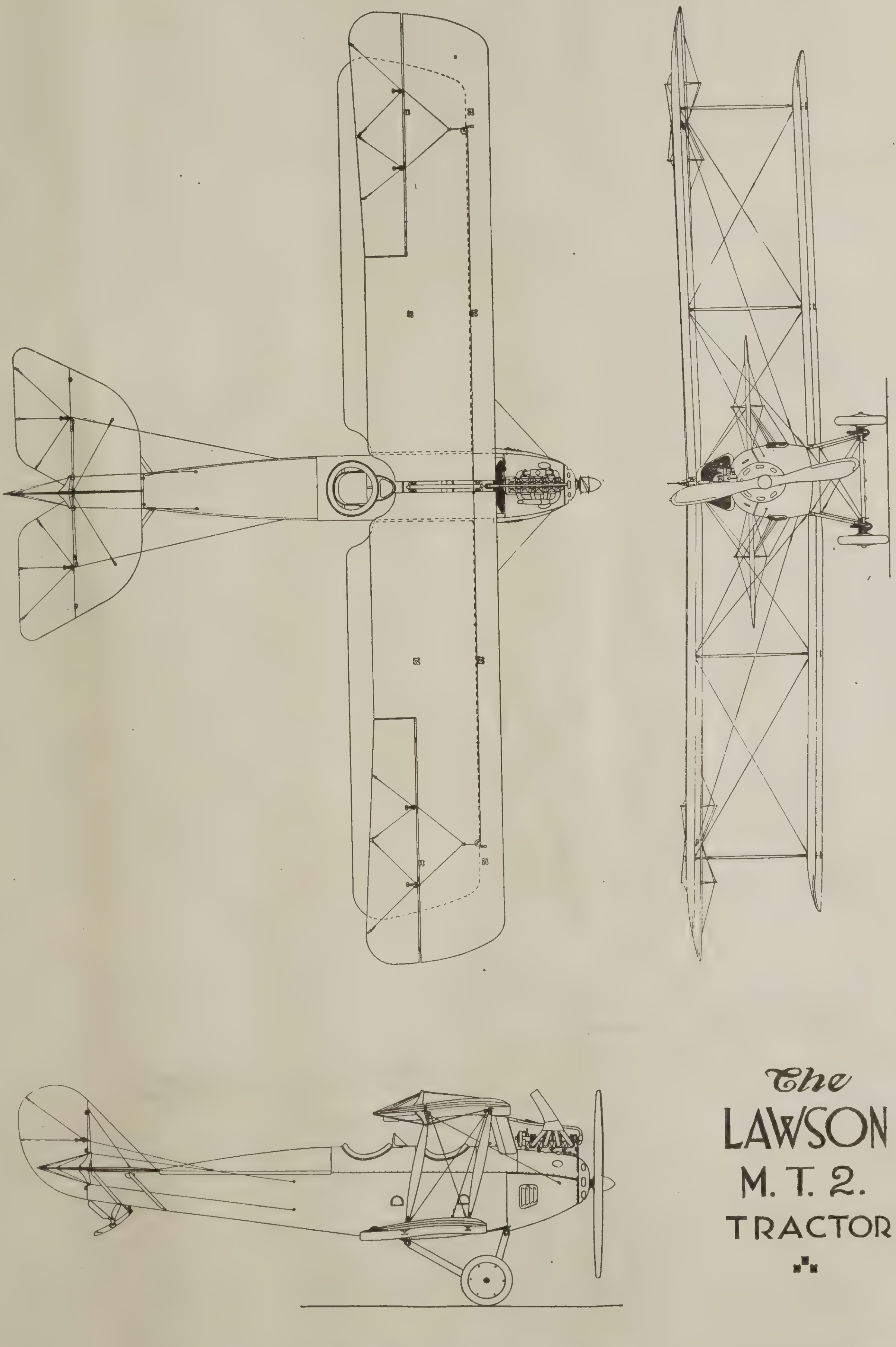
* Photos, drawings and description passed by Censor.



The
LAWSON
M. T. 2.
TRACTOR

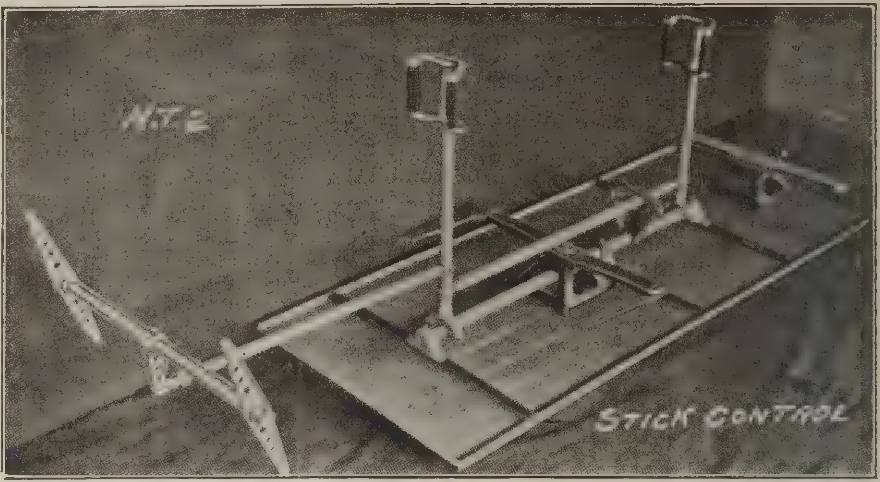
Passed for Publication. Committee on Public Information.

The front of the fuselage is covered with aluminum of the one-piece type. The nose is slightly oval in form and is provided with air holes The main engine cowl in formed to shape and is buldged out on each side and on the bottom. The main engine cowl is provided with inspection doors with louvres. These are readily demountable and can be entirely removed by simply turning a small streamline handle. The deck cowling is made in three sections. The first can be detached for inspection of the gas tank, while the second, which carries the pit padding, can be replaced by a solid cowl in case only the rear seat is used, thereby streamlining this section in. Back of the cowling a linen covered turtledeck is attached by means of hinges which allows easy inspection of all parts in the rear of the fuselage.

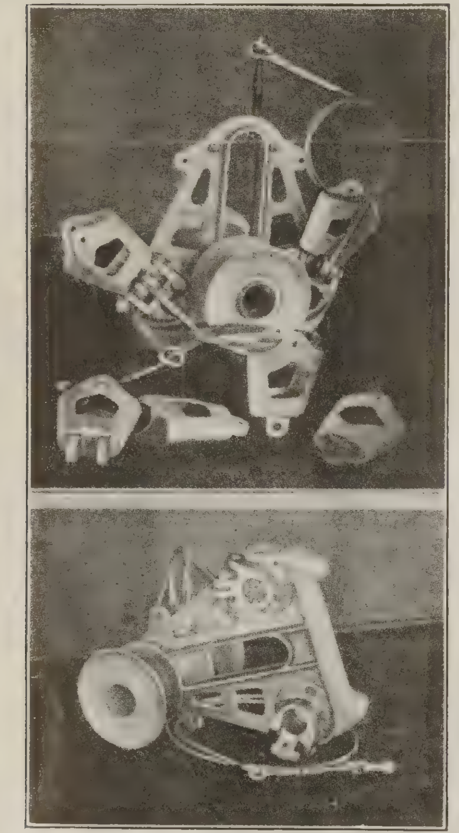
Landing Gear

This consists of the usual V type having two 26x4 wheels mounted on a specially heat-treated axle and sprung by rubber cord absorbers. The guide is set at an angle to take the line of axle action more direct while this latter, as well as the spacer tubes, are enclosed by a streamline casing. This is made with such a section as to be capable of carrying the weight of the axle and spacer tubes while in flight.

The struts are of ash tapered into cup sockets at both ends where they are bolted to lugs on the fuselage and axle guide. Heavy cable bracing takes all side stains. This gear can be entirely dissembled within 15 minutes owing to its simplicity.



The Lawson stick control principle



Some of the specially designed metal parts of the Lawson M. T. 2 tractor

On the rear of the fuselage and on a tube tripod is a streamline tail skid universally mounted. This skid is equipped with a very neat steel shoe to carry any wear which may take place. The universal is of such a design as to entirely eliminate and bending or breaking in case of a side-swipe, for much thought was given on this point. However, by simply removing three bolts the entire tripod and skid are removable in case of a replacement.

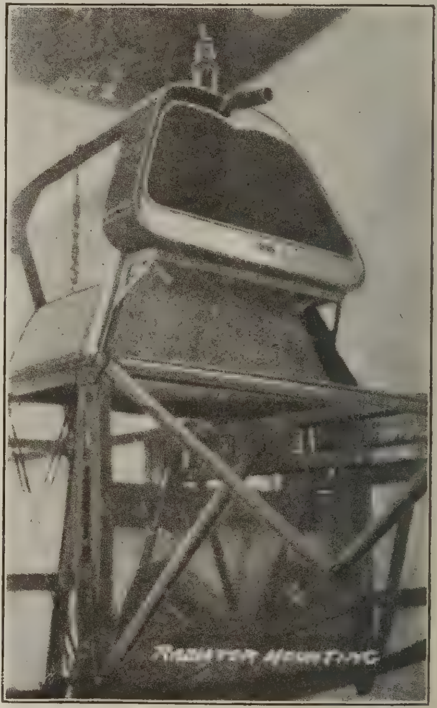
Tail Group

This unit is constructed mostly of steel, the outer edges in all cases being entirely of tubing either round or flattened. The stabilizer is of the double cambered type and is entirely of spruce framework with the exception of the edge. Two spars braced by box ribs and wire take all internal loads while the whole unit is caried below by streamline tubes and above by cable running from the fin tube.

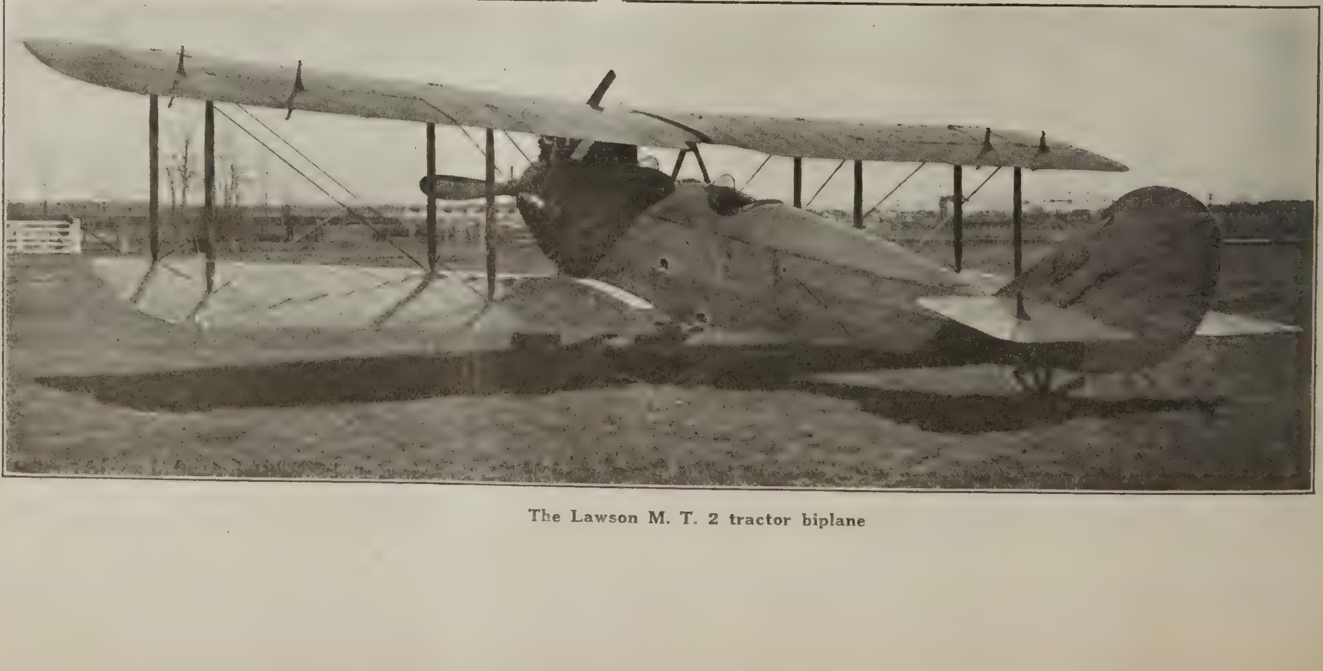
The fin is entirely of tubing welded together Its main tube sockets into the stern post where it is securely held by a bolt.

To both of these surfaces are hinged the elevators and rudder respectively. The former are constructed entirely of steel having pressed steel ribs of channel section and lightened.

These latter two control units are hinged by straps, the rudder having three and the elevators having a total of six. By this arrangement there is no opening between surfaces and at first sight it would appear as if these tail units were of one piece.



The radiator arrangement of the Lawson M. T. 2



The Lawson M. T. 2 tractor biplane

TWENTY-FIVE OF THE ARMY'S 29 AIR SERVICE FLYING FIELDS NAMED FOR MEN WHO LOST LIVES ON AERONAUTICAL DUTY

THE Committee on Public Information issues the following:

The Army air service now has 29 flying fields. Most of the more regular service fields where the graduates of the schools of military aeronautics or "ground schools," receive their actual flying instruction, but some of them are reserved for advanced flying, experimental testing, and special training in bombing, artillery observation, etc. Camp Borden at Toronto, Canada, is also use by the United States in conjunction with the Royal Flying Corps.

With the exception of McCook Field, all the American fields have been named after American officers and men who lost their lives while on aeronautical duty, some of them during the days when aviation was in its infancy, and three civilians who were pioneers in aeronautics—Langley, Chanute, and Wilbur Wright.

While not yet in active operation, Payne, Souther, March, and Mather fields will be opened shortly for flying instruction.

Fifteen New Fields Named

The Government has named and put in operation 15 new fields since last fall. They were named as follows:

Brooks field, San Antonio, Tex.—Named after Cadet Pvt. S. J. Brooks. On November 13, 1917, he was killed while flying at Kelly field, Texas. Brooks was one of the first to volunteer at the call for men for the American Flying Corps. At the time of his death he was in training for a commission as a military aviator.

Carlstrom field, Arcadia, Fla.—Named after Victor Carlstrom. Carlstrom was recommended for a commission in the Signal Officers' Reserve Corps, Aviation Section, on January 10, 1917, and soon thereafter went to Newport News to assist in the training of Army fliers, although not ordered to active duty. He was killed in an accident at Newport News on May 9, 1917.

Fields at Camp Taliaferro

The three fields at Camp Taliaferro near Forth Worth, Tex., have been named Taliaferro, Barron, and Carruthers fields, the last two being named for the following men:

Barron field, Everman, Tex.—Named after Cadet R. J. Barron, who was drowned at Chandler field, Essington, Pa., on August 22, 1917, when the machine he was flying fell into the water.

Carruthers field, Benbrook, Tex. — Named after Cadet W. K. Carruthers, who was killed at Hazelhurst field, Mineola, Long Island, when he was struck by a revolving propeller, June 18, 1917.

Chanute field, Rantoul, Ill.—Named after Octave Chanute, one of the foremost pioneers in aeronautics in America. Mr. Chanute, a civil engineer by profession, established before his death, a few years ago, as great a reputation as a lecturer and writer on aeronautics and kindred subjects as he had previously won as a promoter and patron of flying.

Dorr field, Arcadia, Fla.—Named after Cadet S. H. Dorr, of the Aviation Section. Dorr enlisted in the summer of 1917 and was sent to Toronto, Canada, for training. He met his death there in a flying collision on August 17 of the same year.

Eberts field, Lonoke, Ark.—Named after First Lieut. Melchoir McE. Eberts. This officer was a graduate of the United States Military Academy. On August 11, 1916, he was attached to the Aviation Section, and on March 3, 1917, received the rating of junior military aviator. He was ordered from his station at San Diego, Cal., to Columbus, N. Mex., on May 3, 1917. Lieut. Eberts was killed on the first flight he made after reaching Columbus.

In Honor of Langley

Langley field, Hampton, Va.—Named after Samuel Pierpont Langley, late secretary of the Smithsonian Institution. His early aerodynamic experiments, begun in 1887, formed a basis for practical pioneer aviation. He built and flew the first steam model airplane, 1896, and the first gasoline model, 1903, both of which were capable of prodonged free flight. He also built the first man-carrying gasoline airplane in 1903, which he never succeeded in launching, but which was flown successfully by Glenn Curtiss in 1914.

McCook field, Dayton, Ohio.—This field was named before the idea of naming these aviation fields after Americans prominent in aviation was considered. It was named after the famous American family known as the "Fighting" McCooks, who figured in American military history for several generations.

Mather field, Sacramento, Cal.—Named for Second Lieut. Carl S. Mather, Signal Reserve Corps, Aviation Section, at Michigan, who was killed at Ellington field, Houston, Tex., on January 30, 1918. His death was caused by a collision in the air at 2,000 feet.

March Field, Riverside, Cal.

March field, Riverside, Cal.—Named in honor of Second Lieut. Peyton C. March, Jr., Signal Reserve Corps, Aviation Section, son of the Acting Chief of Staff. Lieut. March met his death at Taliaferro field, on February 13, 1918, as the result of a spinning nose dive.

Payne field, West Point, Miss.—Named after Capt. Dewitt J. Payne, who died February 1, 1918, from injuries received in an aeroplane accident. Capt. Payne was born in South Bend, Ind. Upon graduation from the School of Military Aeronautics at the University of Illinois, he was commissioned as first lieutenant and was ordered to duty in Washington with the schools division. Later he was sent to Hazelhurst Field, Mineola, Long Island, for instruction in flying. He passed his reserve military aviation test on October 16, and continued at Mineola as a member of the staff. On October 23 he was promoted to captain, and on December 11 he was ordered to Taliaferro field, Fort Worth, Tex., where he remained until his death.

Souther Field, Georgia

Souther field, Americus, Ga.—Named after Henry Souther, U. S. R., of Hartford and Boston. He was head of the aircraft engineering division of the Army air service when he died, in August, 1917. He entered the service of the Government in April, 1916, as a consulting engineer of the Aviation Section, and later was the first civilian to accept a commission in the air service as major. He died in line of duty at Fort Monroe, Va., after a brief illness, contracted while acting as director of Langley field, where he was experimenting and testing machines and engines.

Taylor field, Montgomery, Ala.—Named after Capt. Ralph L. Taylor, who was commissioned a captain in the Signal Reserve Corps, Aviation Section, May 3, 1917, and ordered to active duty at Mineola May 23, 1917. On May 28 of the same year he went on duty, requiring regular and frequent participation in flights. He was killed in an accident at Mineola on August 2, 1917. His home was in Stamford, Conn.

The Wilbur Wright Field

Wilbur Wright field, Fairfield (Dayton), Ohio.—Named after Wilbur Wright, and was made by the Government to inculde the pasture where, during those years of experimentation from 1904 to 1907, inclusive, Wilbur and Orville Wright made numerous flights. The first man flight was made by Orville Wright at Kitty Hawk, N. C., on December 17, 1903, in a machine designed by the Wright Bros. and operated by a 12-horsepower engine, which they had built. It was in a part of the territory now known as the Wilbur Wright field that the brothers completed their experiments before Wilbur flew in France and Orville demonstrated the aeroplane for the United States War Department at Fort Meyer, Va.

The First Fourteen Fields

The first 14 fields were named as follows:

Call Field, Wichita Falls, Tex.: First Lieut. Loren H. Call, Coast Artillery Corps.

Chandler Field, Essington, Pa.: Second Lieut. Rex Chandler, Coast Artillery Corps.

Ellington Field, Houston, Tex.: Second Lieut. E. L. Ellington, Cavalry.

Gerstner Field, Lake Charles, La.: Second Lieut. Frederick J. Gerstner, Cavalry.

Hazelhurst Field, Mineola, Long Island, N. Y.: Second Lieut. L. W. Hazelhurst, Jr., Signal Corps.

Kelly Field, San Antonio, Tex.: Second Lieut. G. E. M. Kelly, Infantry.

Love Field, Dallas, Tex.: First Lieut. Moss L. Love, Cavalry.

Park Field, Millington, Tenn.: Fist Lieut. Joseph D. Park, Cavalry.

Post Field, Fort Sill, Okla.: Second Lieut. Henry B. Post, Infantry.

Rich Field, Waco, Tex.: Second Lieut. Perry C. Rich, Philippine Scouts.

Rockwell Field, San Diego, Cal.: Second Lieut. Lewis G. Rockwell, Infantry.

Selfridge Field, Mount Clemens, Mich.: First Lieut. Thomas Selfridge, Field Artillery.

Scott Field, Belleville, Ill.: Corpl. Frank S. Scott, United States Army.

Taliaferro Field, Fort Worth, Tex.; First Lieut. Walter R. Taliaferro, Infantry.

AMERICAN AIRMEN ON FOREIGN SERVICE

May 20th

THE death of Major Raoul Lufbery was avenged by a French aviator, who downed the aeroplane which caused Lufbery's death.

Major Lufbery was buried with full military honors. After the chaplain had read the burial service, a French corps commander, under whom Lufbery had served as a private, made the following speech:

"In behalf of my comrades in the French Army I wish to pay here respectful and fraternal tribute to the body of one of the heroes of the air, a victor eighteen times. He was a son of a noble, generous republic, which came to our assistance to save the liberties of the world. Rest peacefully, Major Lufbery. Close to the martyrs of our great cause your glorious example will communicate to us the desire and spirit of sacrifice until the day when humanity's enemy shall be finally vanquished forever; au revoir."

Captain Charles J. Biddle of Andalusia, Pa., chief of a patrol of the Lafayette Squadron, who was recently reported lost after a combat with the Germans, was found by French scouts in No Man's Land with a bullet wound through his leg. His machine was wrecked. He was brought to the rear for treatment in the hospital.

Captain David Peterson downed another German machine, while on a test flight over the American lines. Peterson has downed five German aeroplanes in four days, but is not credited with the most recent victory, as there was no official observer.

May 21st

An American aviator, a captain from the region of Philadelphia, fought the Germans over the lines east of Ypres with his leg broken by a machine gun bullet, until his engine was disabled. Unstrapping himself from his seat, he crawled into a shell hole, until rescued.

Richard Blodgett, an American aviator, formerly a student at Williams College, has been killed while flying in France. Last week he cabled his father that he had downed his first German machine.

An American aviator from New York State was rescued after lying helpless with a broken leg on a naval seaplane attached to the British forces.

Lieut. William H. Taylor of New York chased a German biplane from the American lines to over Pagny-sur-Moselle, north of Pont-a-Mousson and defeated the German in a desperate fight 5,000 metres in the air. After firing 450 shots, most of them at about seventy yards, the enemy machine went spinning toward the earth in a nose dive. Two American aviators chased two enemy machines to Thiaucourt, and there attacked them. One German machine was sent down in a nose dive, but straightened out before hitting the ground.

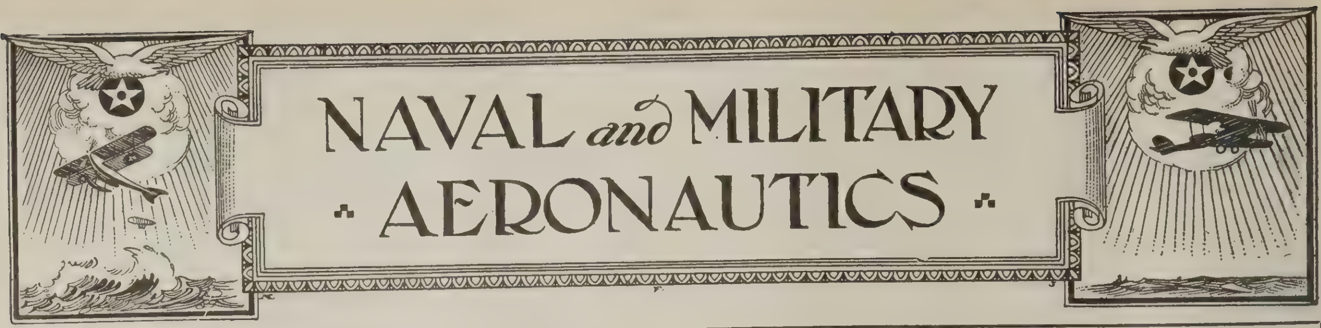
May 22nd

News of the death of Ensign Stephen Potter, naval reserve, who was killed while fighting eight enemy aeroplanes on April 25 was received from the London representative of the Committee on Public Information. Ensign Potter, accompanied by two British planes encountered two German machines, while on a patrol flight. These were joined by two more within a few minutes. After a few minutes of combat the machine gun on one of the British machines jammed. Four of the enemy seaplanes thereupon concentrated fire on Potter's machine and succeeded in downing him.

Lieut. H. W. Preston, of the British Air Force, son of Robert K. Preston, of Chicago, was killed while flying in England.

Lieut. Grenville Temple Keogh, son of Judge and Mrs. Martin J. Keogh, of New Rochelle, has received his second Croix de Guerre for bravery in the French air service on the eastern front. His citation reads:

"An excellent pilot, braving the enemy's cannons with the utmost coolness. On March 20, 1918, in spite of his machine being hit by many shells, he continued to fire his guns and held his post almost two hours in a violent cannonade. He has distinguished himself in several aerial fights, notably that of March 2. 1918.



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BRN—Report to Bakers Field, Rochester, N. Y.
BFT—Report to Barron Field, Fort Worth, Texas.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CWJ—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Camp Jackson, Columbia, S. C.

Note 3—Report to Commanding General, Central Department, Chicago, Ill., for duty with department aeronautical officer.

Note 4—Proceed to Boston, Mass., then Fort Wood, N. Y. for temporary duty.

Note 5—Report to Commanding General, Southeastern Department, for duty as department aeronautical officer.

Note 6—Report to Capt. James G. Heaslet, 870 Woodward Ave., Detroit, Mich.

Note 7—Upon completion of temporary duty in Washington, proceed to Dayton, O.

Note 8—Proceed to Radio School, Columbia University, N. Y.

Note 9—Report to district manager of inspection, 870 Woodward Ave., Detroit, Mich.

Note 10—Report to Commanding General Eastern Department, New York, for duty with department aeronautical officer.

Special Orders 110 to 114, Inclusive

A	
Andrews, Frank H	SLR; DIK
Aubineau, Marion J	DIK
Abels, Walter J	FRF
Alexander, Ludwell B	DIK
Aleshouckas, Joseph W	SLR; DIK
Allen, Hollis Partridge	SLR; KST
Archer, Cecil E	DIK
Andrews, Frank M	FRF
Adams, James Ellsworth	SLR
Archibald, James Albert	SLR
Armstrong, Ralph Sheldon	SLR
Atwood, Richard Hollman	SLR
Alton, Darrel D	SLR
Anglin, Charles H	SLR
Aten, Courtney N	SLR
Anderson, Robert A	FLR
Ankeny, John Calvin	SLR
Anspach, Paul Parker	SLR
Anderson, Werner	SLR
Andrews, Flynn L. A	SMM
Atwater, Benjamin L	SMM
Allen, Albert Gillis	SLR; PMT
Allen, George B	PFO
Ainsworth, Cyril	PFO
Ashton, Raymond	SLR; DIK
B	
Berkeley, Scott Bruce	SLR; PMT
Brackett, Edward Tappen	SLR; EOT
Brown, Thomas Baltzell	SLR; EOT
Brown, Reuben John	SLR; PMT
Brinkman, Walter Emmin	SLR; PMT
Bentley, Frank H	FRF
Bryant, Gordon Spencer	SLR; CWT
Bell, Walter Aiken	SLR; DIK
Boyle, George LeRoy	SLR; PMT
Beattie, Theodore Lee	SLR; PMT
Brennan, James Thomas	SLR; TFT
Burkhart, John C	CPR
Baxley, James H	SLR; DIK
Balhkam, Herbert H	SMM
Barr, George D	DIK
Brenneke, Augustus W	FRF
Burrall, Hallett J	FRF
Brandenburger, Walter O	SMM
Brewster, Morall K	SMM
Butterworth, Russell I	PWM
Blakeley, William Sample, Jr	KST
Burch, Alexander Austin	KST
Barr, Robert J	TFT
Brown, Arthur V	RSD
Baldinger, Ora M	PFO
Block, Adrian	SLR; KST
Bacon, Baughn R	ASM
Barrett, John M	FRF
Bradford, George L	FRF; DIK
Bruch, Russell L	FRF
Bracket, Joseph T	SLR; DIK
Braak, Gail V	SLR; DIK
Boxell, Earl F	DIK
Blake, John R	SLR; DIK
Bissell, Paul L., Jr	SLR; DIK
Belt, Dean Bryan	SLR
Bennett, John Crogan	SLR
Bradley, Leslie Kenneth	SLR
Broms, Clarence Selby	SLR
Burnet, Gilbert William	SLR
Baisley, Herbert Kenneth	SLR
Baker, Kenneth Campbell	SLR
Baxter, Donald Kimberly	SLR
Blackburn, James Mortimer	SLR
Bowen, Clark G	SLR
Babcock, Howard P	SLR

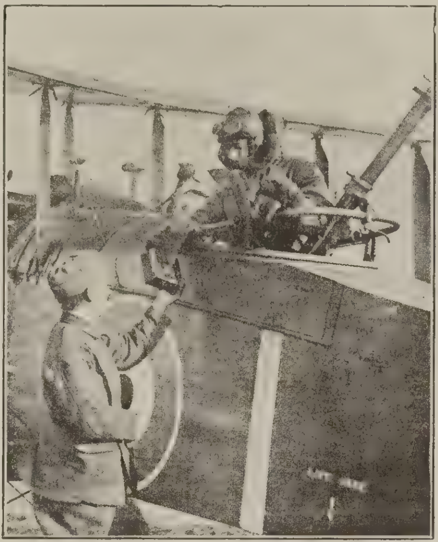
Bailey, Dan W..........................SLR
Baker, Theodore E.......................SLR
Bates, John H...........................SLR
Batten, Eugene C........................SLR
Berggren, Wilhelm Fritjof...............SLR
Brown, Ralph Emerson....................SLR
Barker, Fred Visger.....................SLR
Benjamin, Everett Farrington............SLR
Browne, Belmore..................CPR; AAD
Brown, Charles E., Jr...................FLR
Bradley, Lyman C........................FRF
Burditt, Rollen A.......................SMM
Bowen, Orloff L.........................SMM
Brodie, Dudley David.............SLR; KST
Bogan, Paul A...........................EOT
Brogan, Lawrence E......................REL
Brown, Horace R.........................REL
Baker, John A...........................REL
Brown, William C. F.....................CSO
Blair, Byron Sherman.............SLR; RWT
Baker, Solomon F........................LHV
Beeks, Herbert S........................LHV
Benton, George A., Jr.,.................LHV
Brackett, Edward T......................LHV
Butler, Clyde H.........................LHV
Barr, Lester S..........................FRF
Batson, Shelby H.................FLT; PFO
Brothers, William F..............FLT; PFO
Bordon, Frank K..................FLT; PFO
Bloodworth, Thomas S. M.................FRF
Buzzell, Philip B.......................REL
Bruett, William F.......................FLT
Beattie, Theodore.......................PFO
Burgess, Arthur I.......................FRF
Byron, William D........................FRF
Brown, Edward...........................FLT

C

Critchett, Edward Fowler.........SLR; DIK
Cohen, Abraham Paul..............SLR; PMT
Conklin, Roscoe George...........SLR; KST
Collins, Henry Thomas............SLR; PMT
Cadot, John J...........................DIK
Camp, John Lafayette, Jr.........SLR; KST
Clark, Robert Hazeltine..........SLR; KST
Crane, Emerson Petit.............SLR; KST
Cozzens, John H.........................DIK
Crawford, Louis R.......................CPR
Casserly, James C.......................RTR
Cohn, Marvin H..........................RTR
Carlson, Hilding N......................DIK
Curran, James M.........................TFT
Campbell, Thomas Patterson.......SLR; AAD
Crippen, John Harry..............SLR; AAD
Cary, George A..........................FRF
Caminetti, Anthony, Jr..................KST
Cox, Melvin Duane.......................KST
Campbell, Walter M......................FRF
Curry, Elbert J.........................FRF
Connor, Lawrence H...............SLR; AAD
Colridge, Frank G.......................SAG
Chase, Philip B.........................FRF
Claar, Stewart B.................SLR; BST
Campbell, Hayden S......................BST
Campbell, Walter M......................DIK
Crawford, Reed F........................DIK
Coombs, Cyril L.........................DIK
Cralle, Walter O........................RSD
Calhoun, Preston Browne.................SLR
Campbell, Thomas Edwin..................SLR
Coates, William Thomas..................SLR
Cole, Harold Damode.....................SLR
Crawford, Frank Howard..................SLR
Callsen, Herbert Clarence...............SLR
Carter, Harry William...................SLR
Chauncey, Charles Carl..................SLR
Chase, Lowell Henry.....................SLR
Conrad, Max Henry................SLR; RSD
Conroy, Thomas Payne....................SLR
Cutter, Charles Edward, Jr..............SLR
Carley, Harry Gray......................SLR
Carpenter, Earle J......................SLR
Castor, Bernard Tobias..................SLR
Coffman, Beirne Henry...................SLR
Coleman, Arthur Augustus................SLR
Conant, Rellis Gilbert..................SLR
Cook, Everett Richardson................SLR
Crowdus, Walter Cary....................SLR
Clarke, Chester Raymond.................SLR
Grede, Lloyd Stanley....................SLR
Curtin, James Golden....................SLR
Canfield, John Peters...................SLR
Copley, Kenneth M.......................FLR
Cushman, Holbrook B.....................FLR
Caufield, John H........................SMM
Cygen, Leon.............................DIK
Cragin, Arthur B., Jr...................REV
Carscadin, Henry Ledyard.........SLR; RWT
Cannon, George...................FLT; PFO
Cochran, Thomas B................FLT; PFO
Chapman, George John.............SLR; DIK
Clark, Alfred...........................EOT
Cottrell, Clifton C.....................PFO
Caldwell, Frederick W...................LHV

D

Doubin, Jack............................CPR
Dudley, William McKinley....SLR; PMT; FRF
Davis, Howard Gay................SLR; KST
DeArce, LeRoy Ponton.............SLR; EOT
Draper, George O........................DIK
Davis, Owen Douglas..............SLR; KST
Dean, John Walter................SLR; KST
Drennan, Leonard H......................FRF
Donohoe, Guy F..........................FRF
Dayton, James Wilson.............SLR; PMT
Dayton, Theodore Read............SLR; PMT
Duryea, Leslie Noyes.............SLR; PMT



Return of a day bombing machine. The photos are developed immediately. British Official Photo

Daumont, Louis Burhans...........SLR; PMT
Davis, William Reed..............SLR; AAD
Dickinson, Earl James...................KST
Donnelly, Russell.......................KST
Dow, Harrell............................KST
Doyle, Horace M.........................PWM
Dixon, William W........................TMA
Davis, Edwin K...................FRF; DIK
Dennison, John R........................TFT
Dana, Leslie V...................SLR; BST
Donaghue, Harold R...............SLR; DIK
Daiger, Charles V.......................RSD
Dana, Deane.............................SLR
DeNoyelles, Harold E....................SLR
Dillaway, Manson McK....................SLR
Donlin, Anthony B.......................SLR
Duncan, Lee J...........................SLR
Daniels, Albert James...................SLR
Dana, Alfred Langdon....................SLR
Davidson, Kenneth Seymour Moorehead....SLR
Dawson, Charles Bertram.................SLR
Dine, Herman Joseph.....................SLR
DeVore, Kenneth Lee.....................SLR
DuPree, William Edmond..................SLR
Denison, Arthur Howard...........SLR; HHN
Davis, Harold Eskridge...........SLR; KST
Dwan, James F...........................SMM
Dahl, Leighton..........................SGS
Dawson, Fred C..........................SMM
Dowdall, Joseph..................SLR; PMT
Davis, Claud Alonzo..............SLR; LDT
Donnelly, Clarence Elroy.........SLR; EOT
Duncan, Asa N....................FLT; PFO
DeFremery, Leon.........................EOT
Denny, Archibald M......................EOT
Dunlap, Lionel H........................EOT
Dean, Henry H...........................FLT
Dahman, Wallace W.......................PFO
Dingeman, Henry I.......................PFO
Dimitry, Dracos A.......................FRF

E

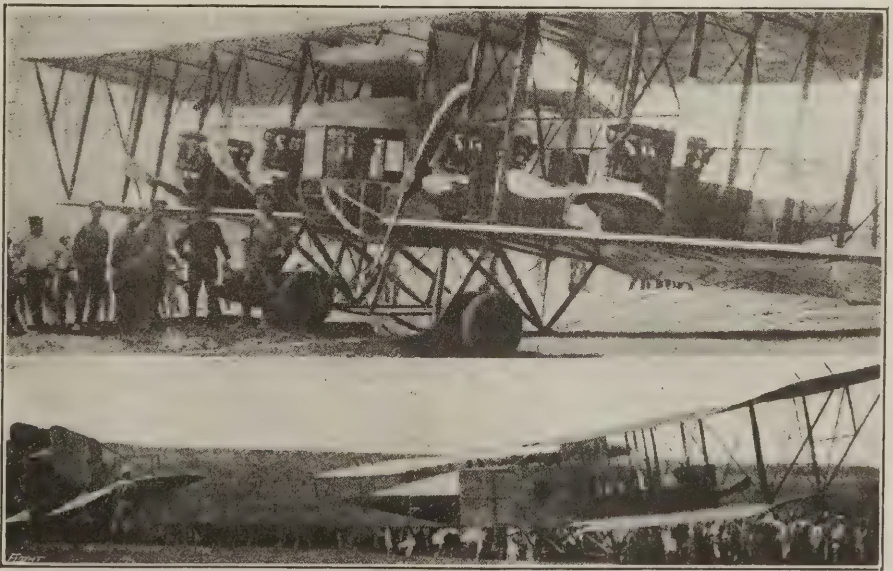
Ennis, James Seferen, Jr........SLR; TFT; (1)
Eaton, Alfred Verle..............SLR; PMT
Elliott, Kerley Commodore........SLR; AAD
Elliot, Edward Bruce.............SLR; TFT
Elliott, Marion Larimore.........SLR; TFT
Elwell, John Alois...............SLR; DIK
Erickson, Erick A.......................DIK
Evans, Floyd W..........................DIK
Elmendorf, Tracy Lake............SLR; KST
Emmons, George B., Jr............SLR; DIK
Ellis, Lyman R..........................WFO
Everett, Edward Clarence.........SLR; PMT
Ebi, Kenneth A...................SLR; DIK
Engh, Harold V...................SLR; DIK
Ellison, Frederick J....................BRN
Eliott, Clinton K., Jr..................DIK
Ehrlichman, Ben B.......................DIK
Edmund, Harvey William..................SLR
Edson, Albert Lovell....................SLR
Ellis, George W.........................FLT
Espy, Bruce M...........................FLT
Eaton, Alfred V.........................EOT

F

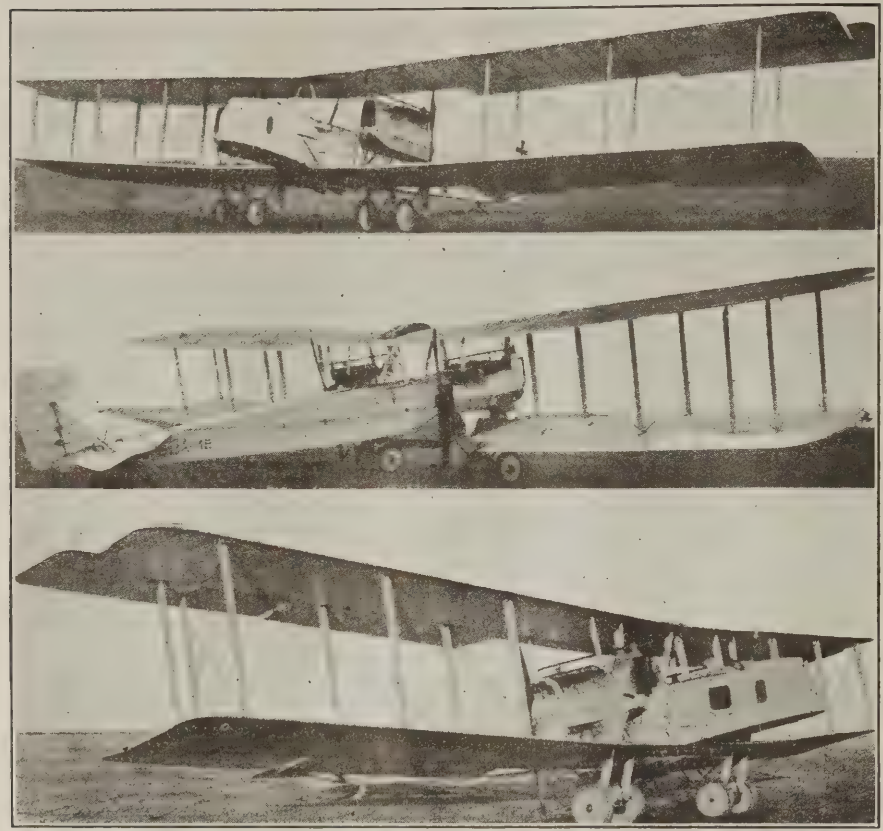
Fletcher, Ward Bowers............SLR; TFT
Ferguson, Melvin Donald..........SLR; KST
Floyd, Robert J.........................TFT
Fraser, Dean B...................SLR; MIT
Forman, Paris R..................REV; CSO
Floyd, George D.........................WFO
French, Jasper..........................FRF
Fisher, Walter C........................PWM
Foster, Traverse Sofield.........SLR; KST
Flickinger, Harrison W..................MIT
Fidler, Charles F.......................DIK
Farren, Philip Henry.............SLR; DIK
Fox, Russell Ralph...............SLR; PMT
Fendrick, Raymond Shannon........SLR; PMT
Fleming, Eugene Calvin...........SLR; PMT
Fiedler, Richard L......................MAC
Fry, Carl B.............................RSD
Feder, Joseph B.........................SAG
Furey, Emmet Edward.....................SLR
Feltus, Russell Hodge...................SLR
Fratt, Charles Diller, Jr...............SLR
French, George Franklin.................SLR
Fitzpatrick, Walter Thomas..............SLR
Foster, Lee Wood........................SLR
Fearn, Edmund, Jr.......................SLR
Fulford, John H.........................FLR
Fry, Frank L............................MSC
Ferris, James Joseph....................SLR
Franklin, William E.....................FLT
Franklin, Albert........................FLT
Frazier, Edward J................FLT; PFO
Flinn, Frank............................REL
Fendrick, Raymond S.....................LHV

G

Griffin, Howard Paul....................SLR
Graham, Joseph A........................DIK
Gilligan, Frederic Mills.........SLR; PMT
Glezen, John Carver..............SLR; KST
Gray, Ralph C...........................FRF
Gordon, Myron B.........................DIK
Graves, Henry Lewis..............SLR; PMT
Green, Lonsdale, Jr..............SLR; DIK
Gideon, Al J............................ELA
Griffin, Charles C......................SMM
Griffin, John E.........................SAG
Grimm, John E...........................DIK
Graham, Alvin Liddon....................KST
George, George Bergen............SLR; WAC
Glenn, Edgar Eugene.....................SLR
Goss, Lewis William.....................SLR
Gowans, Louis Lyman.....................SLR
Graves, Gilbert Shaw, Jr................SLR
Griffith, Frank Leslie..................SLR
Guthrie, Clifford Burdette..............SLR
Guard, James Wesley.....................SLR



Two views of a four-engined Sikorsky biplane, taken from "Flugsport"



Three views of the Gotha Bombing Biplane. Courtesy of "Flight"

Gathings, James Clinton, Jr	SLR
Grisemer, Walter	SLR
Gill, Hamilton Arlinton, Jr	SLR
Giles, Benjamin F	SMM
Griffin, Howard Paul	SLR; CWT
Garnsey, Arlo Ellsworth	SLR; PMT
Gee, Clough F	REL
Gordon, Ambrose	REL
Graetz, Walter C	Note 3
Green, Warren K	Note 4
Garnett, Joseph H	EOT
Gillett,	FLT; PFO

H

Hoye, Vincent J	REV
Hotaling, Harry Dawson	SLR
Honsinger, Frank Thomas	SLR; PMT
Harlan, Roger King	SLR; PMT
Hanst, Charles Edward	SLR
Helweg, Lawrence William	SLR
Hancock, John Martin	SLR; PMT
Hoffman, Joseph Garl, Jr	SLR; PMT
Hegan, Chester Pope	SLR; PMT
Houser, Paul Frederick	SLR; PMT
Haines, Richard S	CPR
Humphrey, Watts S	FRF
Hornig, William Francis	SLR; PMT
Haen, Arthur Gerald	SLR; PMT
Horner, John Severe	SLR; KST
Hunn, William F	DIK
Harrison, Carter H., Jr	REV; HHN
Hammond, Reginald Gilbert	SLR; PMT
Hayes, George William	KST
Hoffman, Wilmer	KST
Hoover, William Joseph	KST
Hughes, Donald Russell	KST
Hammond, Wilbur	ASM
Hughes, Paul F	TFT
Hyde, William A	CSO
Holmes, Wayne N	RSD
Henninger, Roswell W	FRF
Hart, John F	FRF; DIK
Hanley, Harold R	DIK
Hooper, Arthur U	SLR; DIK
Holland, John F	BRN
Henry, Percy C., Jr	DIK
Hall, Damon Irl	SLR
Hartman, Frederick Simpson	SLR
Heston, Adrian Oelze	SLR
Hilton, William Turner	SLR
Honn, Laurence Claud	SLR
Hunt, Roy Earl	SLR
Hurd, Volney Dalton	SLR
Hallette, George E. A	MAJ
Harris, Carl Alvin	SLR
Hartford, Claude Ernest	SLR
Hastings, Morris Ogden	SLR
Hayner, Norman Alexander	SLR
Hegarty, John Laurence	SLR
Humphreys, Frederick E	MIT
Hammond, William S	LDT
Harding, Thomas J	SBI
Henderson, Arnold B	RWT
Hall, Thayer D	FLR
Helweg, Laurence William	SLR; CWT
Howe, Lawrence Luverne	SLH; KST
Hodges, James Pratt	SLR; PMT
Howards, Harlan L	FLT; PFO
Hicks, Charles C	FLT
Honhart, Harold E	FLT
Hanley, Harold R	FRF
Hirsch, Morriss W	FLT; PFO
Hoffman, Raymond L	FLT; PFO
Hurst, Edward	RWT
Harris, Hneodore	EOT
Henriques, Charles R	EOT
Haff, Warren C	LHV
Harlan, Roger K	PFO
Hartford, Claude E	PFO
Herring, Lloyd H., Jr	PFO
Hutchens, Arthur R	REL
Hegner, John R	REL
Hieatt, James P	REL
Haltom, Travis L	FRF
Hood, Randolph McC	REL

I

Israel, Gerald Hearst	FRF
Ivins, Maurice Harvey	SLR; PMT

J

Johnson, Rollin G	SBI
Johnson, Amos Harper	SLR; PMT
Jones, John D	FOB
Jensen, Charles Christian	SLR; TFT
Jones, Lelans S	DIK
Jackson, Paul Clayton	SLR
Jacobs, George Satterlee	SLR
Jarvis, Samuel Gardiner	SLR
Jewett, Harold Alden	SLR
Johnston, Neil Sherman	SLR
Josnstone, Hugh Ross	SLR
Jensen, Jorgens E	FRF
Johnson, George Elmer	SLR; DIK
Johnson, George S	FRF; DIK
Josey, Clinton W	TFT
Johnson, Courtlandt	DIK
Johnson, George P	SMM
Jackson, Clyde H	LHV
Joplin, John F	REL
Johnson, Harry A	EOT

K

Kiley, James Edward	SLR; PMT
Kimball, Alton Howe, Jr	SLR; PMT
Krieger, John Erral	SLR; CWT
Kingsley, Daniel Paul	SLR; KST
Knowlton, Ernest Eugene	SLR; KST
Koffard, Edward L	RTR
Kimche, Charles Paul	SLR; GLC
Kimche, William Harry	SLR; GLC
Koontz, Leonidas L	SBI
Kinney, Clair A	FLR
Knox Walter B	FLR
Kennedy, Chester H	SMM
Kennedy, Reese Garrett	SLR; KST
Kenny, Raymond	SLR
Kimball, Francis Nelson	SLR
Kritzer, Henry Ellis	SLR
Kayser, Allan Joseph	SLR; SBI
Kester, Harold B	BRN
Kinberg, William Oscar	KST
Klyce, William Henry, Jr	SLR; RSD
Kalkman, Eugene C	FLT
Kibbe, Gordon M	FLT
Klinger, Kenneth P	FLT; PFO
Kirby, French	SLR; AAD
Kelley, Harold Clifford	SLR; KST
Killorin, George W	PFO

L

Litterer, Robert Reinhardt	SLR; TFT
Long, Winfred Tyler	SLR; PMT
Latchford, Joseph Thomas	SLR; KST
Lestrade, Harold James	SLR
Lind, John Eugene	SLR
Leonard, William W	EOT
Lycan, William J. B	SBI
Lawson, Oliver M	DIK
Littlejohn, Charles F	CPR
LaPrade, Ernest Maitland	SLR; BST
Link, Rue Showalter	SLR
Lord, Merritt Many	SLR
Lowry, Henry Day	SLR
Lowry, William Joseph	SLR
Lewis, Orman James	SLR
Lindstrom, Ernest Walter	SLR
Lyon, Peyton Brodnax	SLR
LeBrou, Richard Kemp	SLR
Lange, Clarence C	FLR
Lovell, Wm. V	FLR
Lind, John Eugene	SLR; EOT
Leopold, Joseph	MIT
Lindquest, Roy Ferdinand	KST
Lowell, James Russell	KST
Lawrence, Henry Donald	SLR
Lawson, Lawrence A	REV
Lomax, Thorton G., Jr	ELA
Lindsay, Oliver C	DIK
Lestrade, Harold James	SLR; EOT
Lilienthal, John L	Note 8
Lindsay, Oliver C	FRF
Lowry, Henry D	PFO
Lackland, Frank D	FRF
Lick, Walter Emmett	SLR; CWT
Ladd, Arthur K	REL
Lowther, Harry A	REL
Lachmund, Otto Gray	SLR; EOT
Lewis, Oscar B	EOT
Lundell, Floyd A	EOT
Lucas, Philip D	FRF
Lokey, Walter R	FLT

M

Mahoney, William L	DIK
Minshall, Robert	SLR
Morrow, Karl Clifford	SLR
Madden, John Joseph, Jr	SLR; EOT
Marshall, Richard H	FRF
Makielski, Stanislaw J	DIK
Meyer, Alyfred Falck	SLR; KST
Mook, Harold Floyd	SLR; PMT
Minton, Hubert L	SLR; DIK
Macklin, Harold D	SLR; PMT
Meinzer, Fred H	FRF
Mabry, Palmer V	FRF
Minturn, Benjamin Earle	SLR; PMT
Mook, Samuel Richard	SLR; PMT
Micelli, Paul	SLR; EOT
Moyer, Eugene	SLR; DIK
Merrick, Louis M	FRF
Michell, Henry G., Jr	DIK
Miller, Roy E	MIT
Macomber, Henry Made	SLR
Mansell, Isaac Errett	SLR
Maxson, Harold Forbes	SLR
Merkel, Louis Johnson	SLR
Metcalfe, John William	SLR
Morse, Eugene Dorr	SLR
Martin, James Carey	SLR
Megahan, Donald Bruce	SLR
Melican, George Deady	SLR
Murphy, Clement John	SLR; DIK
Maxim, George William	SLR; PMT
Matthews, Charles Hale	KST
Miller, Robert Everts	KST
Morrill, John French	KST
Monell, Harold T	TFT
Martin, Leslie	FRF
Mengel, Herman	DIK
Munchhef, Theodore J	DIK
Mansell, Isaac E	DIK
Markley, John Wayne	SLR
Merritt, Edward Kellogg	SLR
Meyers, Marion Thomas	SLR
Miller, Edward Alexander	SLR
Monahan, John William	SLR
Mooers, Edward Allen	SLR
Morrill, Richard Colton	SLR
Morris, Julian Bates	SLR
Moran, George Sherman	SLR; PMT
Mosher, Roy Bradford	SLR
Murphy, Frank Dwyer	SLR
Murphy, Harry Clifford	SLR
Masterson, Travis S	DIS
Montgomery, Harry G	REV
Mullineaux, Lester R	FRF
Moffett, Paul R	CAP; Note 9
Meir, Milo Splies	SLR; LDT
Murphy, Frederick M	Note 2
Middleton, Mortimer	SLR; RSD
May, James DeG	FRF
Mesnier, Edward S	PFO
Mooney, Herbert R	FLT; PFO
Merrill, George B	FLT; PFO
Mills, Herbert H	Note 2
Mapes, Gordon W	EOT
Montague, Harley H	EOT
Montgomery, Caleb E., Jr	EOT
Murphy, Clement J	EOT

Marble, Lee B.	REL
Morris, Thomas K.	REL
Meany, Philip J.	FLT
Maynz, Theodore	CSO

Mc

McKenna, Edmund Patrick	SLR; TFT
McDuffie, Jasper Kemper	SLR; PMT
McCord, Oscar P.	CPR
McFarland, Jesse Edward	SLR; KST
McCarty, Elsworth Louis	SLR; KST
McLaurin, King H.	DIK
McKinless, Raymond	SLR; PMT
McCarty, Walter Riley	SLR; EOT
McGehee, Abner Francis, Jr.	SLR; DIK
McIllhiney, Donald Walker	SLR
McKellip, Spencer Waring	SLR
McNeil, Horace John	SLR
McDougall, James Clinton	SLR; DIK
McCaffrey, Aubrey Leo	SLR; TFT
McCarty, Murray William	KST
MacCracken, William Patterson	SLR
McCutcheon, Mack D.	REV
McKellip, Spencer Waring	SLR; EOT
McCarron, Henry Albert	SLR
McConachie, Max	SLR
McCuistion, Edward Talmadge	SLR
McEnerney, Daniel Thomas	SLR
McFalls, Edwin Leslie	SLR; DIK
McFerran, Francis Alexander	SLR
McMullen, William Henry	SLR
McConkey, Fred W., Jr.	FLT; PFO
McKey, Claude D.	FLT; PFO
McCabe, Edward L.	EOT
McCarty, Walter R.	PFO
McCormack, Thomas H.	PFO
McFarland, Frank H.	FLT

N

Neff, Lambert Gilman	SLR; TFT; (1)
Neuberger, Lawrence B.	SLR
Norton, Alwin W.	FRF
Neal, Marshall Stanley	SLR; TFT; (1)
Noggle, Roy L.	CGC
Nelson, William T.	DIK
Nelson, Arlen Claron	SLR
Noren, Carl Albin	SLR
Norton, Rolla Warren	SLR
Nott, Sherrard Gabriel	SLR
Neuburger, Lawrence Baerman	SLR; PMT
Nelson, Luther	SLR
Netcher, Charles	AFO
Noland, Ellis A.	CWT
Nauman, George Valentine	KST
Neilson, Halbert H.	PMT

O

Ocker, William C.	REV; MDO; WFO; Note 1
Osborn, Loyall A., Jr.	FRF
O'Neil, Joseph Henry	SLR; PMT
O'Brien, Denis Henry	SLR; DIK
O'Brien, Michael Anthony	SLR; KST
O'Rouke, John J.	UTA
O'Dowda, John S.	DIK
Olson, Carl Nathan	SLR
Olssen, William Edward, Jr.	SLR
Ovitt, Kenneth C.	REV
Ott, Roderick N.	PWM
O'Brien, Raymond K.	SMM
Oatman, Guy R.	SMM
Ormond, Roy Bazanquith	SLR; KST
Oliver, Ralph A.	FLT
Oliver, Maxwell Gordon	REL
Orr, John C.	FLT
Orr, Harold E.	PFO
Orb, John A.	FRF
Olin, Alfred L.	LHV

P

Pulliam, Ralph Collins	SLR; EOT
Pitkin, Loren Hubert	SLR; WAC
Parsons, Arthur Maxwell	SLR; TFT; (1)
Patterson, Frank S.	WFO
Politeske, Edward J.	DIK
Pliska, Joseph S.	DIK
Pollock, John	SAG
Parish, Hayward C.	TFT
Parrott, William Gregory	SLR; KST
Price, Samuel Hoyt	SLR; KST
Petree, Leo W.	DIK
Peck, Lee H.	SLR; DIK
Peterson, James Hopper	SLR; TFT
Penick, John N.	FRF
Palmer, Franklin N.	SLR
Park, John Watson	SLR
Parker, Harold Wayne	SLR
Patterson, Lyman	SLR
Pinckney, Jerald Johnson	SLR
Price, Kenneth Talbot	SLR
Pyle, Carl Weston	SLR
Pawley, George P.	SLR
Pearson, Charles Peter	SLR
Perkins, George Charles	SLR
Putnam, Kingman Wingrave	SLR
Pritchartt, Alexander Vancourt	SLR; KST
Post, John H.	BST
Phillips, George R.	FLR
Page, Robert Newton, Jr.	KST
Parker, Leslie Monroe	KST
Page, John Harry	SLR
Parker, Herbert Wallace	SLR
Philips, Paul H.	DIK
Perry, Pierce R.	FRF
Powers, Ernest A.	DIK
Pendell, Elmer	FLT; PFO
Pope, John B., Jr.	FLT; PFO
Parmelee, Charles Roy	SLR; LDT; FRF
Palmer, Elbridge	FRF
Penland, Clifford Henry	FLT; PFO
Paschall, Albert B.	REL
Poyner, Thomas M.	REL
Parker, Herbert N.	PFO

Q

Quickel, Ralph Detweiler	SLR; WAC
Quinn, George F.	SLR; DIK

R

Reid, Kenneth Malcolm	SLR; AAD
Rose, Joseph Espey	SLR; TFT (1)
Rodriguez, Rodrigo Benneth	SLR; DIK
Roosevelt, Gracie Hall	SLR
Rothstein, Arthur	SLR
Rhinehardt, Claude K.	AGC
Robinson, Geroid	HHN
Rupp, George Willis	CPR
Roberts, Joseph B., Jr.	DIK
Rhodes, Leroy	SLR; DIK
Roberts, Robert J.	CFT
Robertson, Fronzie E.	BFT
Roberts, Francis M.	FRF
Reading, Clyde Williams	SLR
Richards, John Augustus	SLR
Robertson, William Malcolm	SLR
Rosson, Horace Graves	SLR; PMT
Roll, Frederick August	SLR; PMT
Reid, Kenneth Alexander	SLR; TFT
Reynolds, Robert Foster	SLR
Reynolds, Walter Stahl	SLR
Rhoads, Tilford Warren	SLR
Ringland, James Thomas	SLR
Russell, Oscar Velie	SLR
Rettig, Wilford Addison	SLR
Richardson, Ralph Ewin	SLR
Roberts, Edwin Arthur	SLR
Remschel, Robert Henry	KST
Robson, John Matthew	KST
Rice, Ben N. H.	SMM
Rust, Charles E.	SMM
Ritter, Clair A.	RSD
Rogers, Emery H.	SAG
Rolston, Brown	DAF
Richards, Walter E.	DIK
Reeves, Jesse S.	Note 5
Richards, Harrison H. C.	REL
Reakirt, Robert H.	PFO
Robertson, James B.	PFO
Rust, Franklin M.	FLT; PFO
Randolph, Roy J.	REL

S

Smith, Clarence Aloysius	SLR; PMT
Smith, Carl Morris	SLR; TFT; (1)
Sweeney, Raymond Winfield	SLR; PMT
Salisbury, Glenn Charles	SLR; EOT
Stoffregen, Hugh Martin	SLR; PMT
Sullivan, Edward Burke	SLR; TFT; (1)
Sherwood, Newton Bates	SLR
Smith, Harold Daniel	SLR; EOT
Smith, Albert D.	WFO
Smith, Stuart Sawyer	SLR; DIK
Seymour, Lester Draper	SLR; DIK
Stukey, David Chapman	SLR; TFT; (1)
Sims, Earl Edward	SLR; KST
Sowers, Leo Lamont	SLR; KST
Swan, Harry R., Jr.	KST
Simons, John W., Jr.	FRF
Smith, Willard Hawley	SLR; KST
Sanders, Randolph Ramsay	SLR; PMT
St. Clair, Gordon Carlisle	SLR; PMT; FRF
Stephenson, Lovick Leonidas	SLR; PMT
Schneider, Max F.	FRF
Smythe, Clifford E.	CSO
Seiler, Frederick E., Jr.	MIT
Senter, James C.	MIT
Sullivan, Joseph I.	FRF
Stephenson, Arthur B.	FRF
Sutphon, Edward A., Jr.	FRF
Speer, Dallas M.	FRF
Sampter, Herbert C.	FRF
Sexton, Patrick Thomas	KST
Simmon, John Hubert	KST
Sypher, George Benson	KST
Swertfeger, Florian Frank	SLR; EOT
Snowden, Charles N.	MIT
Swingley, Charles E.	FRF
Sias, Donald E.	FRF
Stalker, Thomas A.	ELA
Stoddard, Enoch V.	DIK
Smith, Hugh N., Jr.	MAC
Shaw, Edward P.	PWM
Spiner, Louis H.	SLR; DIK
Stack, Herbert James	SLR; DIK
Shattuck, Ray A.	FRF
Shayes, Fred P.	DIK
Swan, Walter S.	RSD
Sampter, Herbert C.	DIK
Speilman, Harold G.	DIK
Steffer, Charles T.	DIK
Seinle, Felix	CPR
Smith, Clyde Heffner	SLR
Smith, Talcott Proudman	SLR
Smith, Frederick Kirk	SLR
Smith, Leonard L.	SLR
Shrewsbury, Talbot Quarrier	SLR
Strahan, Donald Pierpont	SLR; AAD
Spooner, Malcolm Graeme	SLR
Sandusky, Henry Charles	SLR
Sharon, William Franklin	SLR
Sloan, Harold Olcott	SLR
Snyder, Robert Yarnell	SLR
Sinks, Victor Hammond	SLR; PFO
Stackpole, Frank Charles	SLR
Steward, Wayne, Dudley	SLR
Schlachter, Henry	SLR
Searle, Richard Whiting	SLR
Shotter, Spencer Owens	SLR
Slattery, Frank E.	CRI
Sarthou, Alexander Emil	SLR
Schoen, Irvin John	SLR
Skagerberg, Rutcher	SLR
Stokes, Melmoth Young, Jr.	FLR
Shober, John B.	REV; Note 7; WCS
Smith, Curtis R.	Note 2
Selff, Robert E.	FRF
Sutton, Harold P.	FRF
Shaffer, Oscar N.	FRF
Strong, George E.	FRF
Seward, Douglas C.	SLT; PFO
Smyth, Herbert Crommelin	SLR; EOT
Sample, John C.	EOT
Stenstrom, Samuel A.	EOT
Scott, Robert G.	FLT; PFO
Sherman, Thomas B.	REL
Schoepf, Alfred W.	Note 8
Sansome, Frederick Arendale	FLT; PFO
Shedden, George A.	FLT
Sweeney, Raymond W.	PFO
Smith, Edward L.	LHV

T

Tripp, Isaac, Jr.	SLR; PMT
Tool, Frank Lewis	SLR; KST
Timmerman, Lyman Stephen	SLR; PMT
Tong, James Alfred	SLR; TFT (1)
Torney, Stewart Wellington	SLR
Treon, Roland G.	DIK
Tiffany, Herbert C.	ELA
Thompson, Roland S.	DIK
Treat, Verne Egbert	SLR; EOT
Thorn, Earl Abbott	SLR; KST
Tilden, Sydney Gwyer	SLR; KST
Trimble, Perry Dakin	SLR; KST
Truman, Jonathan Hall	SLR; KST
Tebo, Albert H.	MAC
Taber, Aubrey H.	DAF
Tupper, Preston E.	DIK
Thomas, Murray Watson	SLR
Thompson, Herle Allen	SLR
Thresher, Ebenezer Sanders	SLR
Tate, Leroy Andrew	SLR
Tieman, Frederick Andrew	SLR
Tips, Eugene Conrad	SLR
Texada, George P.	ASM
Taylor, Arthur W.	FLT; PFO
Touchstone, Jonas S.	EOT
Thomas, Charles B.	LHV
Taylor, Arthur W.	REL
Tinnerholm, Ivan E.	PFO
Thompson, Lorin O.	FLT

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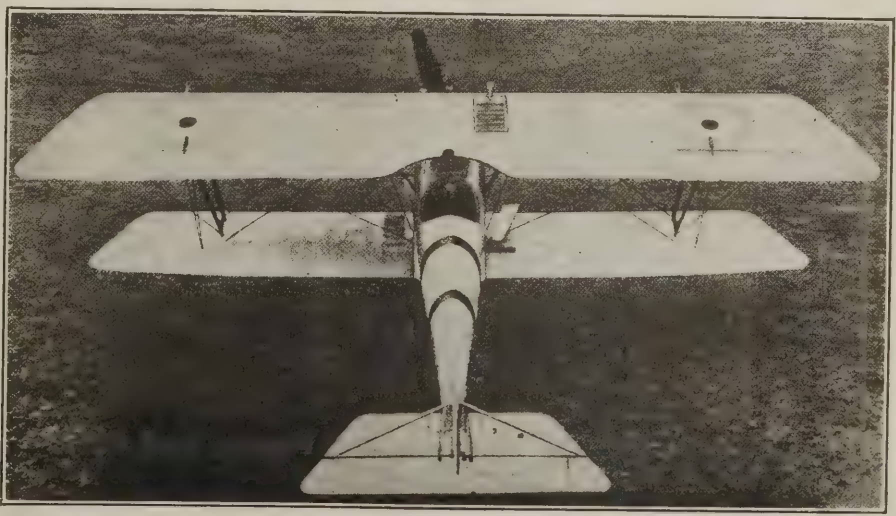
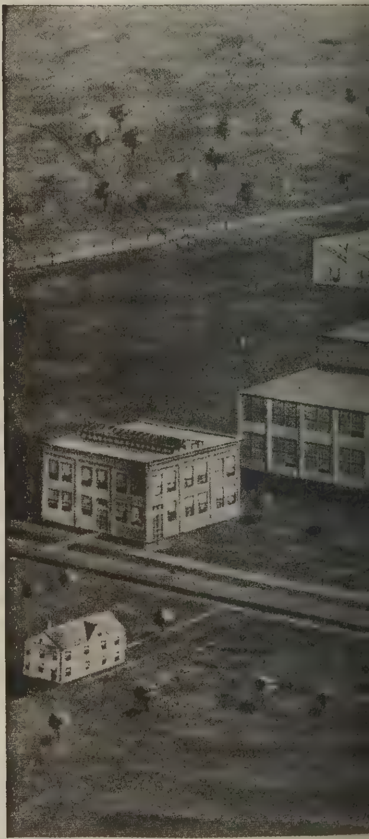


View from above of the German Pfalz single-seater fighter, showing rudder construction

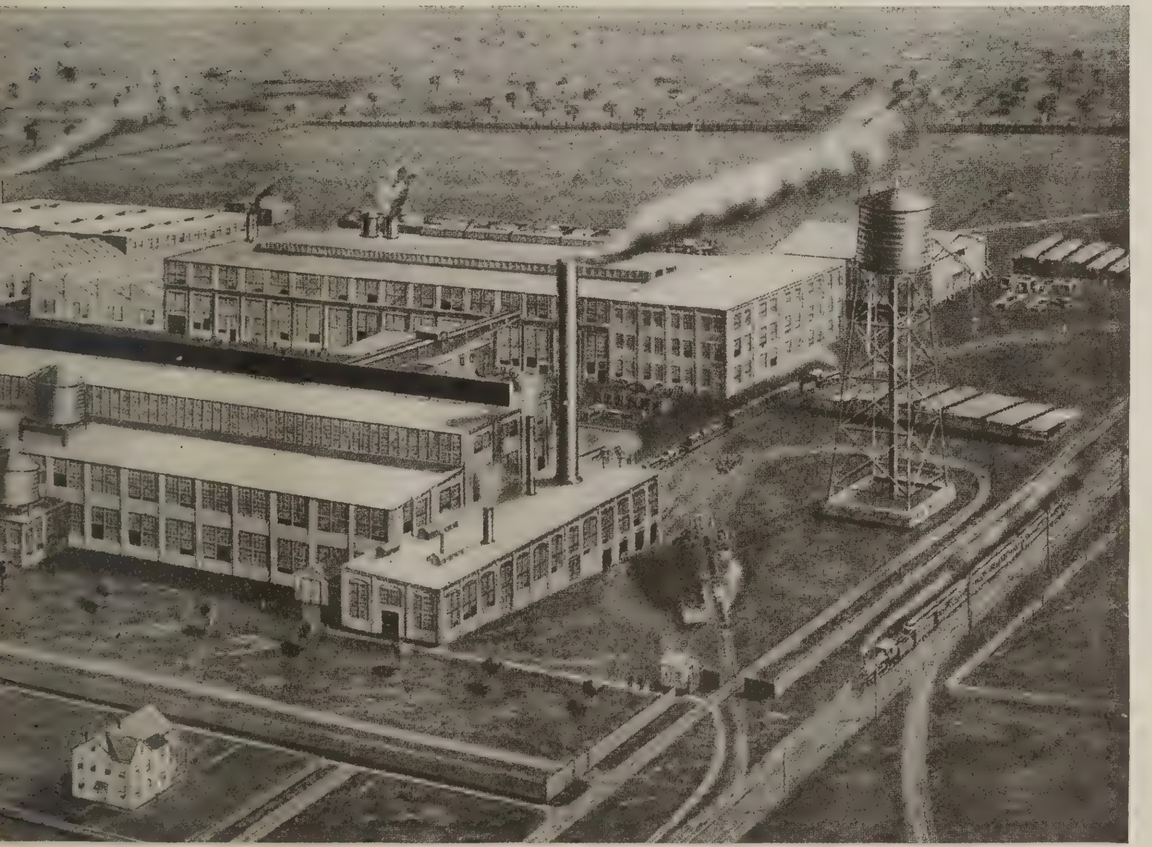
Lawson

M. T. 1
M. T. 2



First Lawson Aircraft Factory, April, 1917.

Second Lawson Aircraft Factory, December, 1917.



Third Lawson Aircraft Factory, April, 1918.

The Lawson Aircraft Corporation

Green Bay, Wisconsin

FOREIGN NEWS

BELGIUM

In a telegram dated May 21st to the Belgian legation in Washington it is stated that "Adjutant Demeulemeester has brought down his tenth aeroplane. In five days this aviator has also set fire to three war balloons. During the night of May 15th, Germans dropped bombs on the hospitals at Hoogstade and at Calais."

FRANCE

Reporting on aerial activity, the French War Office announcement for May 20th says:

"On March 17th and 18th our pilots engaged in numerous combats. Twelve German aeroplanes and four captive balloons were destroyed. Twenty-three enemy machines, badly damaged, fell within the German lines. Three aeroplanes were brought down by cannon fire, one of them by an American battery.

"On the same days and on the following night, 44,000 kilograms (more than forty-eight tons) of explosives were thrown down by our bombarding squadrons on railroad stations, barracks and aviation grounds in the enemy zone. Several fires and explosions were observed, causing a great amount of damage."

The following aerial operations are described in the French official announcement for May 21st:

"On May 19th our fighting pilots destroyed six German aeroplanes, and nine other enemy machines fell within their lines severely damaged. That day and also on the night of May 19th-20th, 25,000 kilograms of projectiles were dropped by our bombing machines."

On May 23rd the French War Office issued the following official announcement:

"On May 20th an enemy machine was brought down in an aerial engagement. It is confirmed that eight German machines were destroyed by our pilots, one on May 15th, another on May 16th and six on May 19th, in addition to machines brought down by our special guns on May 20th and 21st.

"On May 20th and the night following, our bombing escadrilles dropped 17,000 kilos of projectiles in the region of St. Quentin, Noyon and Tergnier; on the stations at Peronne, Rosieres and Nesle, and on the aviation ground at Villeselve. Two big fires, caused by explosions, occurred at St. Quentin and Nesle.

"On May 21st and the night of May 21st-22nd, our aeroplanes dropped 30,000 kilos in the same regions, causing new fires. Cantonments and stations in the region of Villeau-Bois, Hirson, Le Cateau and Aulnoye received in the same period 11,000 kilos of explosives. Italian machines took part in these expeditions.

The French official statement of May 25th reports the destruction of four enemy aeroplanes and four captive balloons. Thirty thousand tons of bombs were dropped on enemy railway stations and aerodromes on May 22nd and 23rd.

Thirteen hundred tons of explosives were dropped and two enemy machines were destroyed on the Eastern front, according to the announcement of May 24th.

The German submarine U-39, according to a Havas despatch from Cartagena, probably was damaged in an encounter with a French hydroaeroplane off Gibralter.

Sub-Lieutenant Fonck of the French aviation service has been promoted to the rank of First Lienutenant.

He recently shot down six German aeroplanes in one day.

"The British aviators successfully bombarded enemy establishments in the region of Demirhissar," says the French official announcement issued on May 19th from the headquarters of the Army of the East.

GERMANY

The German official statement of May 20th states that "London and Dover and other places on the English coast were successfully attacked last night with bombs."

On May 21st the German official announcement summarizes aerial operations for the last three days as follows:

"During the last three days fifty-nine enemy machines and three captive balloons have been brought down."

Bombing operations are described in the announcement of May 22nd as follows:

"On Monday night one of our bombing squadrons destroyed extensive French munition depots near Blargies."

Aerial operations are described as follows in the German official announcement of May 23rd:

"On the Lys battlefield three American aeroplanes, among others, were brought down yesterday.

"The enemy's aerial attacks against Belgian territory which have increased in frequency recently, have inflicted heavy damages and losses on the civilian population, but no military damage has been caused.

"Bombs have been dropped successfully on large enemy munition depots northwest of Abbeville, which were destroyed. Bombs were also dropped on Paris."

"On May 23rd the crew of an observation plane shot down four machines out of a chain of six British one-seater battleplanes," says the German official announcement of May 25th.

Fourteen persons were killed and more than forty others were injured when Entente allied aeroplanes raided Cologne Saturday, according to a dispatch from Amsterdam to the Central News Agency, dated May 21st.

Six allied aviators participated in the attack. Much damage was done to the centre of Cologne, especially in the market place.

Replying to a question as to whether air raids on towns could not be stopped by an agreement, Chancellor von Hertling said on May 23rd that no definite proposals had come from the enemy. Should this happen, he said, the military authorities would be first charged with an examination of the proposals.

GREAT BRITAIN

Successful aerial operations are described in the official announcement issued on May 20th as follows:

"Another full day's work in the air was accomplished on May 19th. Our balloons and aeroplanes actively cooperated with the artillery, observing the fire of our batteries and locating hostile guns.

"The enemy's railway stations, aerodromes, dumps, and billets were attacked by our aeroplanes, which dropped over seventeen tons of bombs.

"Severe fighting occurred well east of the battle line, where our bombing machines were attacked by large hostile formations. Three German balloons were burned, twenty-seven of their aeroplanes were destroyed, and three were driven down out of control. Twelve of ours are missing.

"Bombing operations were carried out vigorously after dark by both sides. Our machines dropped fifteen tons of bombs on the Chaulnes, Douai, and Marcoing railway stations. The St. Denis-Westrem aerodrom was also bombarded, as well as enemy establishments at Braye and Bapaume. A large enemy bombing machine was brought down behind our lines by gun-fire.

On May 20th we dropped a ton of bombs on the gas works, barracks, and station at Landau, northwest of Karlsruhe. The railways were hit several times and fires were started. All our machines returned."

An official statement on aerial operations issued on the night of May 21st says:

"During Monday night aerodromes in the neighborhood of Ghent, Tournai, and St. Quentin used by the enemy's bombing machines were heavily attacked. Thirteen tons of bombs were dropped on these, and four and a half tons were dropped on the railway stations at Thionville, Metz, and Coblenz.

"At 8 o'clock in the morning of May 21 twenty-two heavy bombs were dropped on the railway stations at Namur and Charleroi. One of the machines has not returned.

"Since the beginning of the German offensive, exactly two months ago 1,000 German aeroplanes have been brought down or driven down out of control, and more than a thousand tons of bombs have been dropped over the enemy's lines.

The work of the air force is described in an official announcement issued on May 22nd as follows:

"Balloons and aeroplanes were again active on Monday. Several long-distance reconnaissances were completed and many photographs and observations taken. Bombing aeroplanes dropped twenty-two tons of bombs on the enemy's railway stations, aerodromes, and billets.

"Twelve German aeroplanes were brought down in the air fighting, two others were driven down out of control, and another was brought down by gunfire. Two hostile balloons also were destroyed. Four British aeroplanes are missing."

During the period from May 20th to May 22nd, air force contingents of the British navy carried out bombing operations against the Zeebrugge mole, the seaplane base and shipping in the vicinity, according to an Admiralty statement issued May 23rd. The enemy aerodrome at St. Denis-Westrem and enemy establishments at Thourot were bombed.

Two direct hits on enemy torpedo boat destroyers have been reported, according to the statement, and according to the result of a photographic reconnaissance, one destroyer was sunk. Three enemy aeroplanes were driven down out of control. All the British machines returned.

An Associated Press statement of May 23rd states that German airmen have again bombed heavily British hospitals behind the lines, and this time have killed and wounded some hundreds among the personnel and patients of many different hospitals in the ground.

Very extensive bombing and combat operations are described in the official announcement of May 23rd as follows:

"Our aeroplanes continued on Wednesday their artillery work, photography and bombing. Aerodromes used by the enemy's night-flying machines were re-attacked, eighteen tons of bombs being dropped on these and on hostile billets.

"Thirteen German machines were brought down in fighting. Two were brought down out of control and another by gunfire. Three British aeroplanes are missing.

"Four tons of bombs were dropped on the very important electric power station at Kreusewald, east of Saarbrucken. One bomb struck the boiler house and another caused a large cloud of steam to arise from one building. All the British machines returned.

"The Metz-Sablon railway station was heavily bombed at 11 o'clock in the morning of Thursday. Bombs were seen to burst in the engine sheds and on the railway. The hostile gunfire was considerable, but all the machines returned safely.

"After dark eleven tons of bombs were dropped on hostile aerodromes, docks at Bruges and billets in the Somme area. Several direct hits were made upon a train, causing it to burst into flames.

"Mannheim was again attacked. Twenty-four heavy bombs were dropped on a chlorine factory there, causing two large fires. The blackened girders of buildings gutted by the fires caused by the bombing of the preceding night were clearly visible in the moonlight."

On May 24th it was announced that eight tons of bombs were dropped on enemy aerodromes near Tournai. Three German machines were downed and two others disabled in air fights. Nearly a ton of bombs was dropped on the station at Noganlangen, near Metz.

Eight hostile machines were brought down and two disabled, according to the British official announcement of May 26th. Six tons of bombs were dropped on points near the battle line.

ITALY

The official communication from General Headquarters issued on May 20th says:

"Our airmen dropped eighty tons of bombs in the Val Sugana. Eight enemy aeroplanes were brought down."

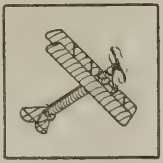
The day announcement for May 23rd from the Rome War Office reports the following:

"The activity of our own and allied airmen was considerable, and eight enemy machines were brought down."

Another announcement was issued on the night of May 23rd as follows:

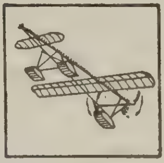
"Five enemy planes were brought down. An aviation camp near Motta Di Livenza and troops on the march, as well as a wagon transport on Asiago Plateau, were effectively bombarded."

Since May 18th, the royal air force operating on the Italian front has downed 24 German aeroplanes and one observation balloon.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

We must next select the proper wing for the model we are about to build. Glancing at the accompyanying drawings, we see cross sections of wings, numbered 1 to 5. We find at No. 1 a flat plane section which is constructed of bamboo strips laid over spruce spars and attached by glue and thread. It will be noticed that this wing is perfectly flat, and if placed on a model at the proper angle of incidence, will carry it through the air. But it is not as efficient as No. 2.

Curve No. 2 is made the same as No. 1, but after completion is bent over a flame by shaping with the fingers until the proper form is had. (After a little practice bamboo can be bent to almost any shape by holding over candle, alcohol lamp, gas, etc. Some model builders soak the bamboo in water before heating, but this is not necessary.)

Curve No. 2 is the better wing shape, because it is proven that a curved plane gives lifting power, even when placed at a neutral, or zero angle of incidence, and because of its simple construction this is the wing form we will use on our Simple Rubber Driven Model.

Curve No. 3 is covered top and bottom and of course passes through the air easier than No. 1 or No. 2, but as it is a little harder to make we will use it when we get further on in our course. The construction is almost the same as the preceding curves, but has a strip of bamboo fastened to the under part as well as the top.

Curve No. 4 is generally found in scale models that fly, or exhibition machines. The rib is made from 1-16 inch thick wood cut to the shape shown, after which holes are drilled at the outer portions for the wing spars, and oval holes like those shown are mode to lighten the rib, thereby saving weight.

Curve No. 5 is a difficult rib to make, and is found only in high class construction. The centre part is called the web and is generally in three pieces. Two strips of thin wood are then nailed and glued to the outer edges, top and bottom as shown. The nose or entering edge is formed by the front spar. The "I" shaped holes are for the main spars. The rib is lightened by oval holes as in curve No. 4. The construction of this last rib is identical with those in the large man carrying aeroplanes.

Now that we know the proper wing form for this model we will proceed to construct the wing and tail.

To construct the wing we select two pieces of spruce ¼ x 3-16 inches and 24 inches long. After rounding off the bottom with plane and sandpaper to the proper shape, make the ribs of bamboo ⅛ inch wide by 4½ inches long. (Bamboo, from summer porch screens can be used for this purpose, if these cannot be had bamboo may be bought at reasonable prices from different Model Aeroplane Supply houses.) Next fasten the ribs in place with thread and glue. Be careful to space them properly, or wing will be heavier on one side.

After ribs are in place, fasten a strip of thin bamboo to the edge of the leading spar, bend to the curve shown, and fasten to the trailing edges of the ribs. Now place over a small flame, bending each rib separately, until proper shape is secured.

The tail is constructed the same as the wing, but not curved as heavily.

The rudder is made from bamboo strips to the shape shown in the drawing.

The covering is of thin paper or light china silk, preferably the latter as it does not tear as readily, held on with glue, after stretching tightly across to prevent wrinkles. (If silk is used it can be sewed to wing.)

The covering is then "doped" with thin shellac or a solution made by dissolving celluloid in banana oil. If the celluloid preparation is used it will shrink the fabric tighter, which helps the model to pass through the air easier and it is lighter in weight.

The body is next made. In rubber driven models of the simple type which we are now building the body part is known as the frame, and such models are termed "Flying Sticks." The word "Fuselage" is given to the bodies of scale or exhibition models.

To make the frame proceed as follows: Two sticks of spruce ⅜ inch x 3-16 inch and 21 inches long. Sandpaper to a smooth finish. Fasten firmly at each end with thread and glue. Drill holes through each end running parallel to the sticks, insert a hook at one end, and place a piece of brass tubing for the bearing at the other end. This bearing is made from brass tubing with a copper washer soldered to it to prevent it coming through, when propeller is wound up. A better idea may be had by referring to the drawings.

The landing gear is made from bamboo strips ⅛ inch square. The method is clearly shown in the drawing. Bend the bamboo to "V" shape, tie a 1-16 inch piece of steel at the apex of the "V's" for the axle. Two tin wheels are next put in place. To hold in position on the axle, wrap thread and glue on the outside ends of the axles.

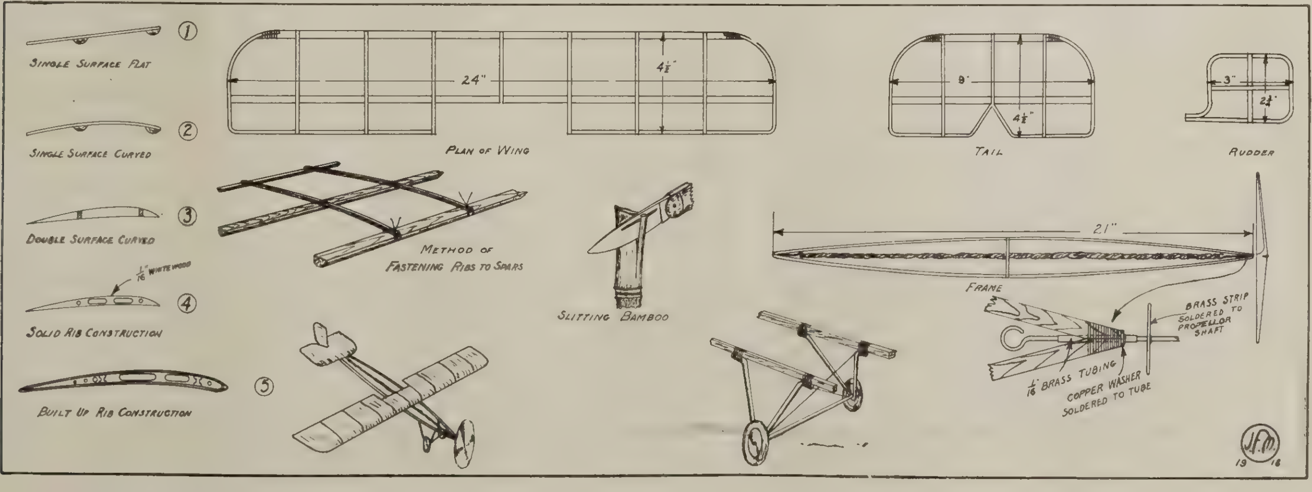
The rubber motor can be bought from any Model Supply house.

The propeller is next to be made, but as it requires a great deal of explaining, along with drawings, we will treat it in a separate article.

(To be continued)

Sergeant J. A. Crane and his Curtiss Military Model

The model shown in the accompanying photograph is of a Curtiss JN4 Military Training Machine, 1/6 actual size, or 6 foot spread. The fuselage and wings were constructed mostly of oak. The fuselage bracing is very interesting, because the longerons were not pierced, special clips being employed to fasten the struts to. The ribs are of solid construction top and bottom, special sockets were made to hold the interplane struts in place. The entering edge of the wing is of oak, and the trailing edge, wire. The fuselage is covered with strong cotton cloth, as were the wings, tail and rudder. The wheels were turned out on a lathe and painted to resemble a disc wheel with rubber tires. The engine cowl is of tin and painted to look as if a motor is underneath. The whole machine is camouflaged brown, green and blue, by the use of common school crayons. The regular army insignia is painted on the wings, and the letters and number J. A. C. 2 on the rudder, this being Sergt. Crane's initials, the 2 standing for the second machine he built.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Going Up

In an authorized interview with Signor Guido Kuidi, who recentlly broke the world's record by climbing to a height of twenty-five thousand eight hundred feet in his aeroplane, the renowned Italian aviator remarked that his chief fear while among the clouds was that he would suddenly bump into the price of coal or the price of wheat. Both, fortunately, continued a considerable distance above him.

Aeroplanes Safest

Gosh, I guess I'm fated to be an aviater of some kind! A feller asked me today if I wanted to go for an observation flight in a balloon an I thot that'd be safe enough, so I went. When we got up about a mile or two he handed me a thing he called a parachute an' told me to jump! he had one, too, an' 'fore I knew it he'd climbed over an' jumped, so I had to, too, or else travel to China, but gosh, I grabbed the darn thing wrong or somethin'! If there hadn't been a lake in the way an' a feller fishin' I guess I'd a been goin' yet! Gee, a aryplane is safe compared to one of them balloons! *Good-night.*

How Nationality Was Changed

A fellow crazy with the heat propounded this: Two Americans fell out of an airship; what nationality were they when they came down? We let the poor nut rave, and presently he gave us the answer. One came down a Russian, he said; the other landed on the telegraph wires and came down a Pole.

Huh-uh. Not Me

Co'se Ah ain't sayin' Ah won't do
Des whut ma country want me to,
But dey's one job at Ah fo'see
Ain't gwine to 'tach itse'f to me—
Huh-uh. Not me.

Dat's dis heah ahplane stuff—No, boss,
Ah'll bah some othah kin' ob cross
Lak drive a mule, er tote a gun,
But Ah ain't flirtin' wif de sun—
Huh-uh. Not me.

Ef Ah mus' do a loop de loop
Let mine be 'roun' some chicken coop;
It ain't gwine be up whah de crows
Kin say Ah's trompin' on deir toes—
Huh-uh. Not me.

It sho' look sweet. Oh, don't deny,
To be a oozin' roun' de sky,
But dat's fo' folks dat's in de mood
To pass up love an' gin an' food—
Huh-uh. Not me.

Down heah Ah firs' saw light ob day,
Down heah am wah Ah's gwine to stay;
Folks, Ah don't keer to hav' ma feet
Git too blamed proud to walk de street—
Huh-uh. Not me.

So, Ah'll jes wait till Gabr'el brings
Dem good ole fashin angel wings
Den, as Ah pass de ahplanes by,
In pity, Ah'll look down an' sigh—
Huh-uh. Not me.

On the Machine Gun Range

Officer in charge: "Each man will bring a magazine with him when it's his turn to shoot."

The first two brought *Cosmopolitans* and the next five *Snappy Stories;* the rest got wise.—*From "Ellington Field Tale Spins."*

Hello, Is This the Aviation Barracks?

Scene—The orderly room.

The telephone rings.

Top: "Yes, this is the aviation barracks."

Voice on the phone: "Well, I would like to order some aviators for a dance next Saturday."

Top: "You what?"

Voice: "Why, I wanted to order some nice young cadets for a party. That's customary, isn't it?"

Top: "Yes, ma'am. How do you want them sent, wrapped up or in a box?"

The receiver is banged down on the hook.

Lapse of two minutes.

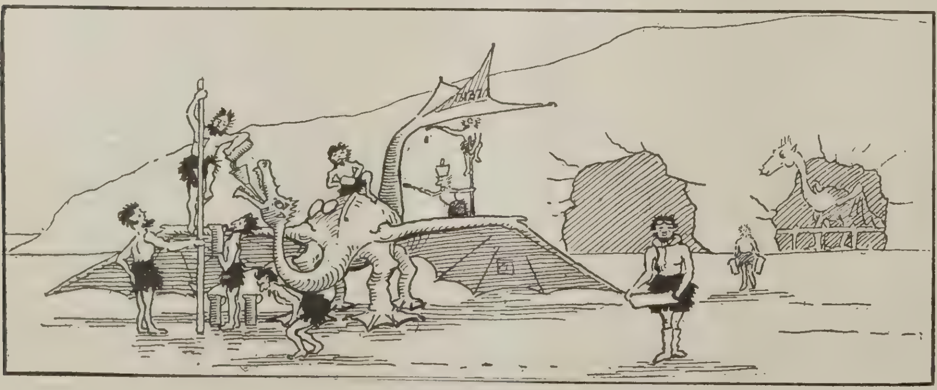
The phone again rings.

Lady's voice: "Have you any boys at the barracks who play bridge?"

Top: "No, lady, but we have some who play a mighty good game of poker."

The conversation ceases abruptly.

And then who says the Top isn't some little social secretary?



A bombing machine of the Prehistoric type about to start. This is a Pterodactyl four-legged bomber. Note the large amount of fuel required to fill its spacious tanks. Courtesy "Flying," London.

Gillette
Safety
Razor

Have You Seen the New Gillettes
Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

Hundreds of officers and men are buying them—the U. S. Service Set in metal case, and the new khaki-covered sets for Uncle Sam's soldiers and officers.

The Gillette is the one razor for the man who is doing things—the one razor with world-wide use and reputation.

When a man wants new Blades he can get them at any Post Exchange or Y. M. C. A. Hut—here in America or Overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

Why do so many of Uncle Sam's Boys use the Gillette?

LET a man spend just one week in the service — then give him free choice of all the makes of razors there are. He'll reach for the Gillette first, and hold on to it — **every time.** There's nothing like seeing the Gillette idea work out in the experience of thousands of men — under extreme conditions.

Here is the No Stropping, No Honing principle—tested and approved by millions of men in the world at peace.

The world goes to war. Millions of men spring to arms — and the one razor that survives the test of war conditions on a world-wide scale is the No Stropping, No Honing Gillette.

There isn't a regiment in the field today under any of the Allied Flags but numbers more users of Gillettes than of all other razors put together. There isn't a condition that a man could find in his shaving—heat, cold, sunburn, wind-chap, water scarce or bad — but has been met by the Gillette thousands of times in its nearly four years of war service.

The fighting man lives in his pack—every inch of space and ounce of weight taken up.

The Gillette tucks away in the corner, or in his pocket—compact, complete—Blades always sharp, always ready—simple, strong, stands the wear and tear—weighs next to nothing — and No Stropping, No Honing.

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VEDOVA TOSI QUIRINO & FIGLI
VIA SENATO, 18, MILAN, ITALY

Hamilton Is the Watch of U. S. Mail Aviators

THE fastest of fast mails, the Airplane Mail Service between Washington, Philadelphia, and New York, reckons its flying time on a Hamilton Watch schedule.
The entire flock of aviators who inaugurated America's historic cloudland mail, wore military aviation model Hamilton Wrist Watches.

Hamilton Watch

The Watch of Aeroplane Accuracy

Famous for years as the watch of railroad accuracy, Hamiltons are carried by the majority of all train crews on lines having official time inspection. And now, worn by the intrepid army aviators who fly with the mail, the Hamilton is also destined to become the watch of aeroplane accuracy because of its thoroughly dependable, continuous, uninterrupted service. The modern watch for every service, whether on the ground, at sea, or in the air.

Military aviation model Hamilton Wrist Watches are made in cushion-shaped silver case, with unbreakable crystal, luminous dial, and khaki strap. There are 32 other Hamilton models to choose from, ranging from rugged utility cases to slender objects of sheer artistic beauty. Prices, $28 to $150. Movements, $15 ($17 in Canada) and up. Sold by all leading jewelers. Send for "The Timekeeper"—the story of Hamilton supremacy.

HAMILTON WATCH COMPANY, Dept. 81, Lancaster, Pennsylvania

Moisture in Spruce

Good spruce may be assumed to shrink about 12½ per cent from the green to the oven-dry condition. The ultimate moisture content of the aeroplane stock in service is probably in the neighborhood of 9 per cent moisture. Each change of 1 per cent moisture at about 9 per cent may be assumed to give about one-twentieth of the total shrinkage; that is, a 1 per cent change in moisture content of good spruce would give .6 of 1 per cent change in volume, equivalent to about .35 of 1 per cent in tangential shrinkage and .25 of 1 per cent radial shrinkage. Were the material allowed to stand for several weks at approximately the humidity condition of the assembling room before manufacture, it probably would all arrive at about a uniform and suitable moisture content. However, under the forced conditions which exist it is safe to assume that the better pieces of machined timber frequently have at least 5 per cent more moisture than they will ultimately have. This change of 5 per cent moisture, which may take between the time of machining the part and its final use would cause a reduction in one dimension of nearly 2 per cent, and in the other of nearly 1½ per cent. In a built-up propeller, any such changes in moisture condition of the finished product would certainly tend to split and twist it, since the different laminations containing different percentages of moisture would shrink unequally. This variation of two per cent in a single direction could also be produced by differences of humidity between a warm; dry season of weather lasting for two or three weeks as against a moist atmosphere for the same length of time. Spruce tends to show a greater shrinkage in heavier pieces than in light pieces. Consequently, pieces of low weight, which would be considered of low quality, would not cause so much trouble from shrinkage as the heavier and stronger pieces. From the foregoing remarks it will be seen that, by throwing out material on account of a very slight under size, except where the dimensions are taken immediately after machining, higher quality pieces are likely to be excluded.

Under the varying conditions of moisture as given above, the random selection of specimens for strength tests is to be discouraged, since the moisture content of the specimen has a tremendous influence on the strength. For example, 1 per cent of moisture causes approximately 5 per cent difference in the crushing strength parallel to the grain. As light pieces may come to a low moisture content and the heavy pieces to a relatively high moisture content at the time of machining, although the ultimate moisture content in service will probably be about the same, specimens taken under such conditions will give abnormally high values for poor material and low values for good material. The tests, therefore, become of practically no value unless corrections are made for moisture —*From Automobile and Carriage Builder's Journal, London.*

Klaxon Absorbs Stentor

The Klaxon Company, of Newark, N. J., has absorbed the Stentor Electric Manufacturing Company, of Long Island City, N. Y.

The Autophone and other loud-speaking telephone instruments formerly manufactured by the Stentor Electric Manufacturing Company, will be marketed by the Klaxon sales organizations.

The Autophone business will be handled from the Klaxon Company's office in the Hyatt Building, Detroit, Michigan.

Longhead Flying Boat Tested

On the 12th of April a new model "F-1" seaplane, built by the Loughead Aircraft Manufacturing Company of Santa Barbara, made a non-stop flight from Santa Barbara to San Diego in three hours and one minute. The distance is 211 miles, and the machine started with a useful load of 1,500 pounds, including four passengers. Refinement of construction is the dominant note of the new sea-plane which is equipped with two 150 h. p. Hall-Scott motors. Enclosed engine-housings, balanced controls, tapered wing construction, and thorough stream lining, have given a machine of unusual efficiency and ease of control. Weighing barely in excess of two tons, it is able to lift and to carry over 2,000 pounds, although its maximum width is just under 74 feet.

Our Flyers "Over There"

American airmen are now and have been for days flying with their British and French allies over the Somme battlefield. Among these airmen are men who formerly were with the famous Lafayette Escadrille and joined the American air forces when we entered the war. Others are Americans who had served in British squadrons, and still others fought for the French in units other than the escadrille.

Charles Kerwood, of Bryn Mawr, Pa., and Houston Woodward, of Philadelphia, both members of the Lafayette Escadrille, have been missing since April 1.

Kerwood, while patrolling in the Somme region, encountered seven German airplanes. He was flying a bombing machine, which obliged him to keep at a lower altitude than his comrades in the patrol, but unhesitatingly engaged one of the Germans. Almost at once a quartet of Germans were attacking him. Surrounded, he defended himself bravely with his clumsy bombing plane against the lighter battle planes.

Woodward left on a scouting expedition on April 1 and has not returned, and there is nothing to indicate whether he fell into German hands as a prisoner or met another fate.

Mechanics from the American air squadron have been doing excellent work at various British airdromes during the present battle. These men are serving in considerable numbers, and their help has been exceedingly valuable in the time when the British airmen have been waging such intense warfare.

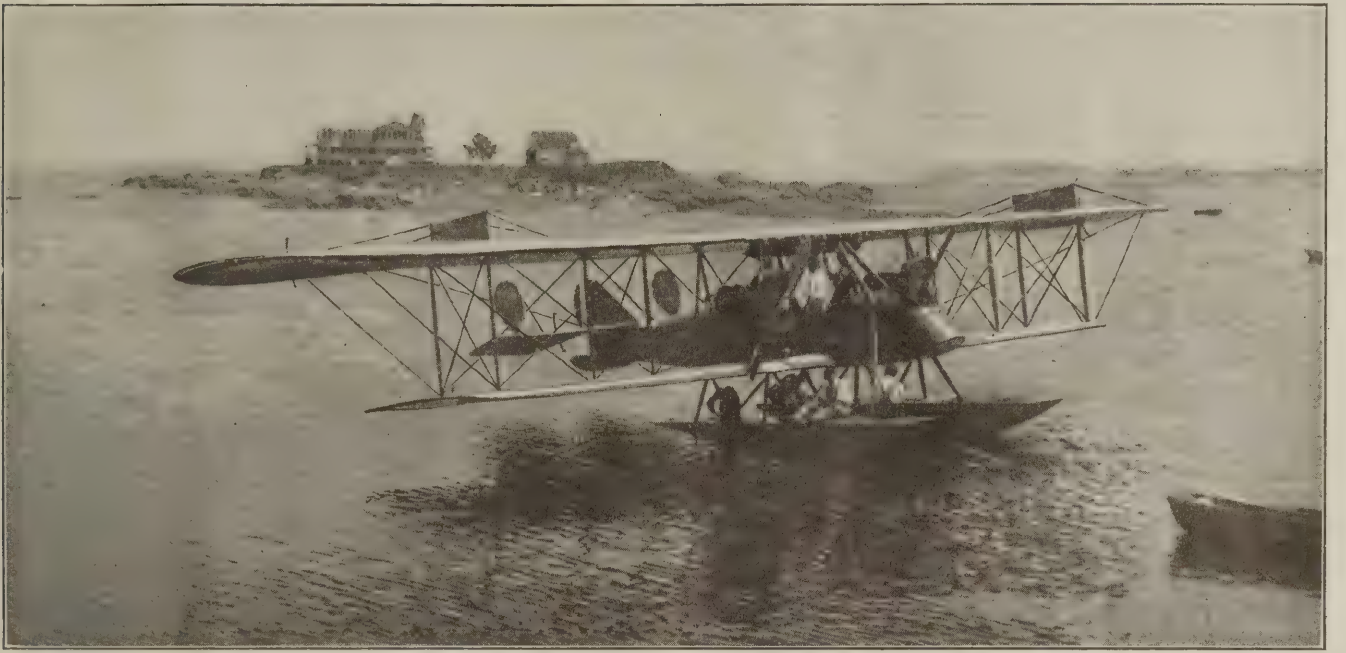
There have been places where there were concentrations of hundreds of British machines, and it meant untold labor for the mechanics. Some of the airmen have been making as many as six trips in a single night. One hard-working squadron dropped six tons of bombs in one night. The record of the whole air corps has been remarkable. One aviator shot down six German machines in one day.

American Signal Corps officers are congratulating themselves on the bringing down of a German aviator, out to destroy the one observation balloon back of our lines. The Boche had circled around behind the balloon station and was on his way toward it when a French aviator circled above him and fired bullets into his petrol tank, forcing a landing.

The pilot was captured. He had written instructions to destroy the balloon at all costs. He said the Germans blamed the balloon observers for the accuracy of the American artillery fire recently.

Personal Pars

K. B. McDonald, formerly vice-president of the Curtiss Aeroplane & Motors Corporation of Buffalo, has been commissioned a lieutenant-commander of the United States Navy, and placed in charge of the naval aircraft factory at League Island Navy Yard, Philadelphia, Pa.



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(*Continued from page* 580)

Magnetos

The dimension specifications for British and for American magnetos are substantially the same, with the exception of one dimension of magneto space. The American specification of the taper as one in five is the same as the British specification of the taper as one in ten, owing to the fact that the British refer to the slope of the conical surface to the axis.

Nomenclature

Representatives of the National Advisory Committee for Aeronautics and of the Society of Automotive Engineers are conferring with the committee of the Aeronautical Society of Great Britain on nomenclature.

Instruments

It is necessary to standardize further the connections and attachments and also the general character of the indication of instruments.

International Unification of Units of Measurements

The plan, provisionally adopted by the subcommittee of the International Commission on Pipe Threads, which met in Paris, July, 1914, for a standard method of designating units of construction, was discussed, with reference particularly to screw threads and gear-wheel teeth, the idea being to seek a unit which could be used when either the inch or the metric system is employed. Taking screw threads as an illustration, a system of notation was outlined by which each screw would bear a distinctive number based on the diameter in eights of an inch, and the pitch in the number of threads per inch or per 127 mm. (which equal five inches), without reference to the unit in which the measurement might be made. For example, a ¾-in. U. S. standard bolt having 10 threads per inch would be designated a "6 x 50" bolt in countries using the metric system. The selection 127 mm. as the length over which the number of threads should be stated in countries using the metric system is based on the fact that this gives *whole* number of turns, these being five times the number of threads per inch.

The very difficult problem ot bringing together the advocates of the metric and of the inch bases is, in abeyance, but it is felt by some that the plan outlined above may afford the first step.

Plywood and Cements

The British specifications for plywood and for casein cement were discussed in detail.

Glue

The practices in the preparation and use of glue are much the same in the United States and Great Britain. Mechanical methods of application and electrical methods of heating are used largely here, but neither of these methods is common in England. Comparative tests of British and American methods of testing glue are being made.

Timber

The question of spruce supply was naturally discussed. Kiln procedure has been simplified, the results being satisfactory almost invariably. It is appreciated by all that the splcing of wood is an important subject. Additional approved designs of laminated and box spars will be recommended.

Structural Tubing

The possibilities of further development in the methods of drawing and heat treating tubing are being studied, with promise of marked improvement.

Lubricating Oil and Gasoline

The gasoline and lubricating oil questions require continued attention, to assure adequate supplies of proper quality. Compounded oils will be furnished where required, as well as grades of gasolines of proper homogeneity and low endpoint.

Propeller Hubs and Fittings

Propeller hub and fittings practice will be further unified so far as shall prove advisable and possible.

Water and Fuel Piping

Co-ordination of water and fuel piping standards is largely dependent on thread practice. The use of outside dimension only for nominal diameters of metal tubing has been recommended by the British and the American Committees.

Electrical Apparatus

The practice in electrical apparatus peculiar to aircraft, such as signal lights, radio, generators, batteries, heating and protective devices, is under consideration in view of more extensive use.

Wheels and Tires

The British and American practice in wheels and tires are substantially in accord. Discussion is being had as to the advisability of extending the list of wheel sizes which has been adopted here.

The number of tire sizes will be kept to the lowest possible minimum.

Steel Wire Cables

The British and the American steel wire cables are sufficiently alike to be practically interchangeable. The same thing is true of high-tension steel wire.

Turnbuckles

It is felt that similarity of design is not necessary in turnbuckles, satisfactory interchangeability being securable if the fork-end and pin dimensions are standardized.

Gasoline Rubber Tubing

Comparative tests are being made of gasoline rubber tubing made to British and to United States specifications.

Installation of Apparatus

Standardization will be effected so far as possible in the location, mounting, size, and indication of direction and method of operation of instruments and apparatus.

The Work in Hand

The single aim in considering the various matters is to ascertain to what extent we can, without interfering with our productive capacity, adopt European standards with advantage; to what extent we can assist more effectively in cases of European conformity with our practices; following the course that will bring the best results. That which does not contribute to the winning of the war is or quite secondard importance. Anything that does contribute to the winning of the war is obviously of prime importance.

As was pointed out by Mr. Winston Churchill, British Minister of Munitions, at the Inter-Allied Aircraft Conference, the detailed standardization of aircraft materials among the Allied Powers now fighting the Germans, is based on principles so obvious that they really do not require emphasis; the principle of a common front, of the freest possible communication, a lateral communication, between all parts of the front, of common reserves, upon which all can draw at any moment, of interchangeability of troops and of materials of all kinds at any moment—these are clearly steps which enable us, although we consist of many nations, fighting for a common cause, to realize day by day and week by week the continuous approach toward complete unity of action and all the efficiency and integrity of action which come from a simple purpose and a single system.

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LUMA Radium Luminous Compound

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Luma adds to the safety of night flying by making the dials of all indicating instruments plainly visible in the dark.

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Literature and full information upon request

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[illegible]

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Germans Said to Have Abandoned Dirigibles

What seems like confirmation of recent reports to the effect that the manufacture of dirigible airships had been practically given up in Germany in favor of the production of airplanes is found in the last annual statement of the German Airships Company of Frankfort, printed in German papers reaching London.

According to the "Frankfurter Zeitung" the year's profits on construction have fallen from about $34,000 to $14,000, "because the company had to abandon for the most part its former branch of construction. The airship sheds belonging to the company are valued at only $39,000, as compared with $80,000 a year ago. It is stated that "since the autumn of 1917 the company has devoted itself to a new field of work, which promises reasonable profits."

(*Continued from page* 591)

V

Van Veghten, Theodore Shafter	SLR; EOT
Vedder, Horace Egleston	KST
Van Valin, Oliver J	SLR; DIK
Vance, Earl T	SLR; DIK
Vinton, Benjamin	FRF; DIK
Vaux, Richard	ELA
Vogel, Arthur D	FRF
Van Buren, Henry M	SMM
Van Capen, William	SLR

W

Walker, Lambert Roger, Jr	SLR; EOT
Whittier, Burton Harold	SLR
Williams, Fred Forman	SLR; PMT
Wallace, Vester McCageah	SLR; PMT
Williams, Fred James	SLR
Winn, Edward Lawrence	SLR
White, William Emmett	SLR; PMT
Woodward, Mark Rhey	SLR; EOT
Wiederkehr, William A	TMA
Woodbury, Henry Burchard	SLR; KST
Waterman, Ira D	DIK
Wheeler, Donald B	S DIK
Whitney, Cornelius Vanderbilt	SLR; TFT
Wurtele, Valentine	KST
Warzbachm Carl Carlipp	KST
Watrous, Harold Knapp	SLR; KST
Walch, Clarence H	FRF
Whiteside, Harold C	RES
Welch, Kenneth Curtis	SLR; EOT
Welsh, Floyd E	SMM
Whitney, Lyman F	CWT
Washburn, Edgar Bassett	SLR; KST
White, Will G	TMA
Waugh, Harvey C	RSD
Wiegman, John P	SLR; DIK
Williams, Stanley T	CSO; SMM; Note 1
Warfield, Henry M	CPR
White, William P	CPR
Wylie, William Bone	SLR; PMT
Watkins, Herbert H	SLR; DIK
Watkins, Karl Nixon	SLR
Watkins, Dudley Warren	SLR
Waise, Aaron Louis	SLR
Walker, Earl Chester	SLR
Wardell, Charles Henry, Jr	SLR
Waters, Leland Leslie	SLR
Weatherdon, Edwin John Todd	SLR
Wendell, Lay Arthur	SLR
Winn, Edward Lawrence	SLR; CWT
Waltham, Ralph Owen	SLR
Williams, Glenn Earl	SLR
Wincote, Charles Blackman	SLR
Wilson, James Edward	SLR
Walf, Clayton Samuel	SLR
Wonsey, Ray Dot	SLR
Walton, John Martin	SLR
Walker, Vivian L	SMM
Wienges, Paul C	SMM
Winter, William	AGC
Westerhaus, Luther W	SLR; RSD
Walrath, George E	Note 6
Wray, James H	FLT
Wyman, Tupper	FLT
Wertimer, Sidney	FLT
Wettlaufer, Ralph C	EOT
Warren, Edward W	PFO
Webb, James E	PFO
White, James H	PFO
Wyckoff, Henry W	FRF
Walker, Roy M	FRF

Y

Yarwood, Bertram Hunter	KST
Young, George E	DIK
Young, B	SLR
Younger, John Elliott	SLR
Yackey, Wilfred Alonzo	SLR
Young, David Rappaport	SLR; CSO

Z

Ziesmer, George F	FRF
Zabriskie, Charles	SLR; FRF; PMT
Ziebur, Max C	DIK
Zaiss, Leonard Charles	SLR
Zander, William Edward	SLR; RSD

(*Continued from page* 583)

- Chas H. Smith, secretary and associate chief of section.—Branch 1166, War.

Hide, leather, and tanning material section:
- C. F. C. Stout, chief.—Branch 2443, War.
- Maj. Jos. C. Byron, harness, bag, strap, and belting leather.—Branch 2444, War.
- Henry W. Boyd, in charge of sole leather.—Branch 2444, War.
- Fred A. Vogel, in charge of upper leather.—Branch 2444, War.
- E. C. Shotwell, glove leather and sheepskins —Branch 3062, War.
- E. J. Haley, tanning materials.—Branch 2443, War.
- Maj. Seth Williams, Marine Corps representative.

Legal section:
- R. J. Bulkley, chief.—Branch 84, Room 1209.
- W. C. Saeger.—Branch 54, Room 1206.
- H. M. Channing.—Branch 53, Room 1207
- C. W. McKelvey.—Branch 169, Room 1206.
- H. A. Friedlich, Branch 86, Room 1210-b.
- Louis S. Weiss, Branch 188, Room 1210-c.
- F. T. Nelson, Branch 192, Room 1210-a.
- Adrian Ettinger, Branch 87, Room 1208-b.
- E. M. Dodd, Jr , Branch 93, Room 1208-c.
- D. H. Van Doren, Branch 193, Room 1208-a.

Linen thread section:
- George F. Smith, chief, Branch 2397, War Department.
- Harry Kennedy, assistant chief, Branch 2397, War Department.
- Maj. Seth Williams, representing the Marine Corps.

Linters and cotton goods section:
- George R. James, chief, Branch 305, Room 917.
- Spencer Turner, executive director, Branch 80, Room 101.
- Grosvenor Ely, member, Branch 80, Room 101.
- Lieut. Col. Charles N. Black, Procurements Division, Ordnance Department, representing the Army on cotton linters.
- Paymaster Kane, Navy representative.
- Maj. Seth Williams, Marine Corps representative
- John P. Bourke, Emergency Fleet representative.
- Walter C. Stitt, American Red Cross representative.

Lumber section:
- R. H. Downman, chief, Branch 100, Room 4.
- Charles Edgar, Branch 100, Room 4.

(*Continued on next page*)

SPERRY

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MANUFACTURE
of
AERONAUTICAL INSTRUMENTS
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BROOKLYN NEW YORK
15 VICTORIA STREET LONDON S.W.I. 126 RUE de PROVENCE PARIS.

(Continued from preceding page)

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- Walter E. Chamberlin, Branch 100, Room 4.
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(*Continued from page* 578)

To Begin at the Beginning

"As a practical matter, however, it is evident that in the endeavor to determine whether there is a basis for a civil suit by the government or a criminal prosecution it will be necessary for us to make a thorough inquiry into the entire history of aircraft production since the beginning of the war and of all proceedings which have been taken by any persons or corporations concerned therewith. We shall not be able to ascertain whether there has been dishonesty or malversion of any kind unless we go thoroughly into all the transactions which have been had.

"If we discover a basis for civil suits by the government they will be instituted. If we find grounds for a criminal prosecution it will be in order to go before the Grand Jury to obtain indictments. If we find no sufficient basis for such proceedings our conclusion, to be convincing to the country, could not well be stated as a mere negative conclusion in general terms, but should be accompanied by a fair, candid and adequate statement of the facts which our investigation has disclosed. We should, of course, in no case make any statement which from a military point of view should not be made, and if we had a basis for civil or criminal proceedings we should properly reserve the evidence so far as it would be appropriately disclosed upon the trial and previously withheld.

"But I am very sure that the country would not be content with our inquiry, and particularly if we discover no ground for further proceedings, unless we showed the basis for our conclusions in an adequate report of the facts we have ascertained. This certainly should be dispassionate and impartial, and be confined to the facts. When we are in a position to make such a report of our inquiry we shall know the facts, and it will be reassuring to the country and support our inquiry, and its reputation for integrity, if we state concisely, but fairly and completely, the results of our investigation.

Wants to be Unhampered

"If it be understood that we contemplate this course of action I should suppose that there would be a general disposition to permit our investigation to proceed unembarrassed by any other parallel course of action. Clearly as we may recognize the authority to conduct another official inquiry at the same time, we cannot doubt that any official inquiry into the same course of conduct, although with another aim, would tend to make difficult, if not impossible, the successful prosecution of our own. Either nothing of importance would be elicited, which would make such an inquiry needless, or points would be brought out which would at once suggest to the guilty, if there be such, where effort should be made to block successful prosecution.

"Even with the best intention in the world it would be almost impossible to know in advance what should be gone into and what should be left untouched.

"We might be following a promising clew, only to find our efforts unintentionally thwarted. We are instructed to have a prompt and thorough investigation, and my desire is that we should have the fullest opportunity to make such an investigation, and in order that we may have this opportunity it is desirable that it should be generally understood that when we are through we shall state the facts we have ascertained in the manner I have suggested above, to the end that all may be satisfied to await the result of our investigation. When we have reached that result I should suppose that our report would have such a thoroughness that it would be accepted as the final statement in the matter, unless, of course, some new evidence not discovered by us should thereafter come to light.

"Very sincerely yours,
(Signed) "CHARLES E. HUGHES."

Mr. Gregory Agrees

The Attorney General's letter accompanying Mr. Hughes' letter follows:—

"Hon. George E. Chamberlain, U. S. Senate. My Dear Senator:—

"At an interview between you, Judge Hughes and myself last Saturday you asked what would be the scope of our pending inquiry into the aircraft problem, and also indicated that you would like to know what we thought might be the effect upon our work of an investigation by a committee of the Senate into the aircraft program. Subsequently I suggested that Judge Hughes write me a letter embodying his ideas on the two points involved. I herewith enclose copy of his letter, and will state that I agree with the views therein expressed.

"Respectfully yours,
(Signed) "T. M. GREGORY,
"Attorney General."

Differences Smoothed Out

Mr. Hughes' letter and its reception by Senator Chamberlain and other Senate leaders seemed to smooth out all difficulties and to give assurance that his inquiry will not be merely into any possible criminal phases of the scandal, but that he will be permitted to establish what the fault has been if it was not criminal.

Differences concerning the Chamberlain resolution were straightened out by the adoption of a substitute resolution permitting the appointment of investigating sub-committees, but it was tacitly understood that the one on aircraft production was to keep its hands off what was happened in the past, so that Mr. Hughes will have a clear field.

Senator Chamberlain announced the appointment of these sub-committees, in addition to the sub-committee authorized to conduct the aircraft investigation:—

To investigate ordnance—Senators Hitchcock, Fletcher, Beckham. Weeks and Wadsworth. To investigate the Quartermaster Corps—Senators McKellar, Beckham, Kirby, Sutherland and Johnson. To investigate the cross-licensing agreements of aircraft manufacturers—Senators Fletcher, Myers, Sheppard, Warren and Knox.

Statement by the Attorney General Concerning Aircraft Investigation

The Department of Justice authorized the following:

On being asked in what way Cols. W. S. Waldron, R. L. Montgomery, and Edward A. Deeds, of the Signal Corps, who were on Tuesday ordered to report to him, would co-operate and assist in the pending aircraft investigation, the Attorney General replied:

"We will seek and obtain full information with respect to all transactions in connection with aircraft production, but it must be distinctly understood that no person concerned in any transaction under inquiry will be permitted to have any part in the conduct of the investigation."

AERIAL AGE WEEKLY

Vol. 7, No. 13 JUNE 10, 1918 10 CENTS A COPY

Enlarged snap-shot of a three-motored Italian Caproni triplane in flight

War Carried to America by U-Boats

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WAR CARRIED TO AMERICA BY U-BOATS

THE war has been brought to America by the U-boats. Appearing before the Senate and House Naval Affairs Committees within a few minutes after the news of the operation of German submarines along the Atlantic Coast had been made public, Secretary Daniels, according to newspaper dispatches, said that the Navy Department had known of the presence of U-boats in American water since May 25. While not expressing the decided opinion that the military authorities had been expecting such an attack, he did say, however, that this Government was able to protect coastwise shipping, and in the future all transports would be convoyed the entire distance by destroyers. This policy, he said, had been decided upon as necessary after the sinking of the transport liner President Lincoln, when it became apparent that the German submarines were operating in wider areas than in the restricted war zone.

On June 3rd the U-boats began this drive. The reports, as we go to press, state that the following boats have been sunk:

Jacob H. Haskell, schooner, 1,362 tons, hailing from Boston, sailing for Norfolk; 11 in crew, no passengers.

Isabel B. Wiley, in ballast. Net tonnage, 611; crew, 8.

Hattie Dunn, of Rockland, Me.; net tonnage, 365; in ballast, sailing for Charleston.

Edward H. Cole, of Boston; tonnage, 1,395; in ballast, bound for Norfolk; crew, 11.

Herbert L. Pratt, steamship, oil tanker; sunk about five miles south of Overfalls Lightship, off the Delaware Capes. Thirty-eight on board; 37 of the crew rescued and landed at Lewes; one lost.

Carolina, passenger steamer, N. Y. & Porto Rico Line; net tonnage, 5,093. Passengers, 218; crew, 120. Total so far reported saved, 298; drowned at sea, 16; unreported and missing, 24.

It appears that the schooner Edna, which was found bottomside up several days ago and towed into Lewes, Del., was also a victim of the submarine. The crew of the Edna have been landed at New York. The master of the Winneconne picked up the crew of the Hattie Dunn.

According to published reports there are only five naval air stations on the Atlantic Coast. According to the published French and British reports it takes an air station at about every twenty miles to afford an adequate patrol against U-boats. As early as May 26, 1917, in a public session of the Chamber of Deputies, Admiral Lacaze, the French Minister of Marine, explaining the system of patrol against U-boats along the coast said in part: "We have organized seaplane posts all around the coasts so that the zone of action of each post joins that of its neighbor on either side."

The only extensive work on submarine hunting published is the chapter on the subject in Henry Woodhouse's "Textbook on Naval Aeronautics." This book gives the history of the employment of aircraft for hunting U-boats and the methods employed, and points out the absolute necessity of having plenty of seaplanes, dirigibles, and kite balloons for this purpose.

Thanks to the Aerial Coast Patrol Commission, of which Rear-Admiral Peary is the chairman, and to the efforts of the Aero Club of America, there were organized in 1915-1917 four aerial coast patrol units, the members of which were subsequently taken over by the Navy Department, and are now in the Naval Reserve Flying Corps.

The country will need every aviator who has had flying experience, and who may have applied for service and were told that they were not needed in the past. These men should apply again, sending their application to the Navy Department without delay.

The army air service proved of great help to the Navy in this emergency for the minute it became known that U-boats were operating along our coasts the Army aeroplanes at the Hazelhurst Field, Mineola, and elsewhere, were in service for aerial coast patrol work. They succeeded in rendering valuable assistance in locating boats loaded with men from the boats sunk by the U-boats.

Training Aviators to Hunt U-Boats Through Extension of Aero Mail

A committee from the Aero Club of America visited Washington on June 3rd to call on the Postal and military authorities to urge the extension of the aeroplane mail service to other cities east, west and south and thereby give hundreds of military aviation students their much needed training in cross-country flying.

Mr. Alan R. Hawley, president, and Mr. Henry Woodhouse, member of the Board of Governors of the Aero Club, told Second Assistant Postmaster Praeger that nothing that has been done by the War Department and the Post Office has met with such general approval as the giving of cross-country flying training to our military aviation students.

The big purpose of the aeroplane mail is the military value of training the military aviation students so they will be ready to lick the Germans not only on the western front but also right off our coasts hunting the U-boats which are beginning to sink our ships right near home.

To hunt U-boats, like conducting bombing operations against German bases and military formations, requires thorough familiarity in flying by compass under all conditions. To plot the position of U-boats or destroy a German base with bombs requires extensive experience in flying by compass by dead reckoning.

By extending the aeroplane mail service from New York to Boston and from New York and Washington to Chicago by way of Wheeling, West Virginia, and Lima, Ohio, and from Washington to Pittsburgh, Cleveland, Dayton and Detroit, and then from Detroit and Chicago to St. Louis, an extensive system of advance training can be evolved which will turn out aviators fit to take up bomb dropping duties upon their arrival at the western front.

Military authorities advised the Aero Club Committee that they have plenty of training aeroplanes and they are only too glad to co-operate with the Post Office in extending the aerial mail service so as to give advance training to military aviation students.

LARGE INCREASE IN AIRCRAFT PROGRAM NEEDED FOR REPLACEMENTS

THE fact that it takes a minimum of 40% replacements in aviators per month and 100% replacement in machines per month to keep our air forces in fighting condition is, at last, becoming generally known. The New York *Sun* for June 3rd printed the following dispatch from Washington:

> The published figures showing that 1,137 aeroplanes were downed in May on both sides in the fighting on all battle fronts, of which 750 were enemy planes, have ex-

cited much interest in military circles here as emphasizing the growing superiority of the Allies in the air and also of what may be expected when America really comes into the struggle in force.

But there is another feature that is not overlooked here, and that is the shortening life of the aeroplanes, now put at not more than one month. This has compelled a revision of all the early estimates regarding the number of machines necessary to give the superiority counted upon to blind the Germans and win the war.

Reports reaching here lately have been to the effect that Great Britain was now producing aeroplanes at the rate of 3,000 a month, while France had attained a production of 2,000. This would mean an annual production for these two countries of 60,000, or nearly three times as many planes as was called for in America's original aviation programme—22,000 machines. Instead of the 22,000 machines promised the first year only 5,076 have thus far been completed.

It is regarded as doubtful that this country can exceed the present rate of production in Great Britain before next year. There are some who believe that we will be doing well even then if we are able to maintain constantly at the front 2,500 machines. Figuring on the life of a plane being only one month this would require a production here of 30,000 machines a year. However, the addition of 2,500 machines to the 5,000, which according to reports here are now being maintained at the front by Great Britain and France would be a factor of tremendous importance in the military situation, according to army officers. Then, too, this rate of production is bound to be increased eventually.

A year ago 50,000 aeroplanes was talked about by some as sufficient to "blind the enemy." In view of the short life of the aeroplane it is now realized that this number is not as big as it looks, meaning only about 4,000 machines in the air constantly.

THE AIRCRAFT INVESTIGATIONS

THE sub-committee on aircraft of the Senate Military Affairs Committee decided on May 27 to go ahead with its inquiry into aircraft production. This decision came after Senator Thomas had told the sub-committee that Charles E. Hughes, special investigator for the Department of Justice, had stated that he was not opposed to an investigation by the Senate Committee so long as it did not interfere with his own investigation.

Senator Thomas quoted Mr. Hughes as saying that unquestionably the subcommittee had a field of inquiry before it in the failure of aircraft production, if it wished to go into that. He only urged that the committee keep clear of the criminal phase of the situation, if any actually existed, so he might go ahead unhampered. This the committee agreed to do.

The Senate committee will leave Washington toward the end of this week on a tour of aircraft factories throughout the country to get intimate data as to production. Later the committee will conduct hearings, some of which will be in secret and others in public.

"The sentiment of the subcommittee is that the people of the country want to be informed as to what has happened to prevent the manufacture of aeroplanes," said Senator Thomas. "The production, every one knows, has been startlingly small. The facts must come out. If we strike evidence that may better be handled by Mr. Hughes in his criminal investigation, it will be at once turned over to him. The Senate committee is not after any one's scalp. All we want to get is facts, so that the country may know."

May 28—Senate Investigation

Representative Kahn, ranking Republican member of the House Military Committee, said in the House debate on the Army Appropriation Bill, that aeroplanes and engines are being manufactured and sent abroad in large quantities.

Chairman Dent of the Military Committee said the Government had contracted to pay $850,000,000 for aeroplanes up to this time. This he itemized as follows:

For planes, propellers and parts, $186,000,000; for engines, $240,803,170; balloons, $9,390,240; machine guns, $28,496,921; clothing, $2,500,000, and general equipment, $32,000,000.

In the week ended April 27, he said, 110 training planes, 19 advanced training planes, 7 combat planes 214 primary training engines, 108 advanced training engines and 86 combat engines had been shipped abroad. There are now, he added, 3,439 aviators in the army, against seventy-three when war was declared, and 19,000 men training in this country and 5,477 training abroad.

Mr. Kahn said a number of young men offered commissions as First Lieutenants if they would train abroad received Second Lieutenancies, others coming into the service later having been put ahead of them. This was one of the mistakes he admitted had been made and should be corrected.

Mr. Kahn said much time had been lost on the air programme in trying to create an engine, and that production had been hindered by the action of co-belligerent nations. He denied reports that only one or two battle planes were in France, and added that the official reports of our men having brought down enemy planes were sufficient evidence that we had battle planes abroad.

One-third of $640,000,000 for aeroplanes, he concluded, was actually spent, while the balance and more has been contracted for.

Chairman Dent said the Military Committee had given the War Department substantially what it asked and had gone carefully into its expenditures, finding duplications in some instances. The delayed consideration of the bill, he added, was due to Secretary Baker's absence in France.

May 28—Hughes Investigation

The Senate Military Committee was asked by Charles E. Hughes, conducting the Department of Justice's aircraft investigation, for all information the committee has bearing on delays in the aircraft program. It will be turned over immediately.

Plans for co-ordinating the department investigation and that to be conducted by the Military Committee were discussed at a conference held by Chairman Chamberlain of the committee, Mr. Hughes, and Attorney General Gregory.

May 29—Senate Investigation

The Senate Committee's aircraft investigation was commenced. Witnesses were Colonel W. C. Edgar, in charge of the construction division, and his assistant, Lieutenant-Colonel E. Lester Jones. Their testimony was given in secret.

Committee members announced, according to press reports, they were satisfied with the statements of the witnesses, and that while the expenditures had been above normal, they were not exorbitant in view of extraordinary conditions under which construction work was carried on.

May 31—Hughes Investigation

Officers of the Signal Corps in charge of awarding contracts for aeroplanes were called before Charles E. Hughes, in charge of the Department of Justice's investigation into aero production, and questioned. Attorney General Gregory and Mr. Frierson, Assistant Attorney General, participated in the examination.

Mr. Hughes explained that much of his work hereafter will be the questioning of witnesses to supplement information obtained from War Department and Aircraft Board records. The identities of the witnesses will not be made known, but it is understood several prominent men connected with the air programme are to be called within a few weeks.

Senate Investigation

The aircraft production subcommittee of the Senate Military Committee plans a "surprise" visitation upon some of the aircraft plants of the country. The five Senators will slip quietly out of Washington, to appear at the least to be expected point of their proposed itinerary and delve straightway into the work of investigating at first hand.

Evidence of extravagance, negligence and sloth is the sort of data which the subcommittee members have started out to find. It was tacitly admitted at the Capitol that the first point of scrutiny would be in the middle West at one or another of the plants where Liberty motors are being assembled. After its investigation of machine shop and assembling plants for the engine the subcommittee will visit those points where aeroplanes are being assembled and where frames, bodies and wings are being constructed.

It is not the intention of the subcommittee to hold hearings while away from the capital. Of course questions formal and informal are bound to be asked, and if the situation demands it the subcommittee has its right to administer oaths and take testimony right on the ground, should such a course seem necessary.

One of the principal reasons for the studied avoidance of investigation under oath without every necessary concommitant of a regular investigation will be the desire on the part of the committee to give no "immunity baths" or to permit no aircraft contractor or engineer to commit himself to a statement which might interfere with the investigation undertaken by Charles E. Hughes.

THE NEWS OF THE WEEK

Aero Mail Service Pleases Burleson

Washington, May 28.—With the arrival of the aeroplane mail in New York at 2.30 P. M. the first two weeks' service operated by the army for the Post Office Department between Washington, Philadelphia and New York has been completed to the satisfaction of the postal authorities.

According to an announcement, out of the twelve trips eight were completed before 3 o'clock in the afternoon and two before 3.50 P. M.; one trip was completed at 2.25 P. M. and two at 2.34 P. M. There were two delays, when the mail reached New York at 4.45 P. M.

The aeroplane mail from the north arrived in Washington six times before 3.30 P. M., twice between 3.30 and 4 P. M., and four times after 4 P. M.

All letters got special delivery service promptly on arrival at point of destination. "The success obtained in operating the aeroplane mail service," said Postmaster General Burleson, "exceeds what I expected of the new route during its initial stages. The army has rendered a splendid service, which is not only a distinct contribution to the commercial world but is proving valuable training for the aviators who are about to enter upon a greater task in France."

Bevione Appointed Italian Commissioner for Aeronautics in America

Rome, Italy.—Giuseppe Bevione, member of the Chamber of Deputies, has been appointed Italian Commissioner for Aeronautics in America, according to news dispatches from Rome. He is editor of the *Turin Stampa.*

W. C. Potter Appointed Assistant Director of Aircraft Production

Washington, D. C.—W. C. Potter has been officially appointed assistant director of aircraft production by Mr. John D. Ryan, according to an announcement recently made public.

Government Leases Testing Field

Detroit, Mich.—A tract of ground one-half mile square, located near the Lincoln Motor Co. and the Fisher Body Corp. plants, has been leased by the government for testing aeroplanes. The land was offered to the government without charge but it insisted on paying for it.

Browning Aeroplane Gun Gives Satisfaction

Washington, D. C.—Announcement was made by the War Department that the Browning Machine gun had successfully undergone a test to determine its value for use with aircraft. The statement is made that the gun functioned perfectly and that the model of the weapon to be used with aircraft will be the heavy type with the outer jacked removed.

The gun used fires through the propeller and is controlled by a hydraulic or mechanical device, and impulses from the crankshaft are transmitted to the machine gun.

In the recent tests, the gun was mounted on the frame of an American combat plane and connected with the aeroplane engine. The test was conducted on the ground and in place of the propeller a metal disc was attached to the crankshaft. The Browning gun was then required to register hits on the metal disc as it revolved at varying speeds from 600 to 2,000 revolutions per minute. The slightest "hang fire" or delay in action on the part of the gun bullets to hit precisely on the spot on the disc representing the centre of the zone of fire. The gun functioned perfectly.

The United States will also employ the Marlin aircraft gun, which is also a synchronized weapon. The Lewis gun is used on aircraft, but only in two seater machines. The French and British use the Vickers synchronous gun.

New York City Darkened As Air Raid Precaution

The New York City police authorities, appreciating the necessity of being ready for any emergency in connection with the presence of the German U-Boat raiders off the Atlantic coast, on June 4th issued the following order:

"All commanding officers of the Police Department:

"All display lights, advertising signs, or special illumination throughout the city, including the seashores, will be discontinued until further orders. This will not include city lights.

"In office buildings and dwelling houses where lights are used, shades will be drawn where it is possible to do so.

'Notify all concerns immediately."

The interests concerned in the city promptly obeyed the police instructions.

Seaplanes Fly to Havana and Return

Havana, May 31st.—Three American hydroaeroplanes flew from an American naval aviation training centre to Havana, Cuba, in a practice flight. The flights were made without mishap or incident. On the following day, June 1st, two of the three machines returned safely, but one machine, before getting away was damaged by bumping against a barge, but was repaired and left under its own power.

The third hydroaeroplane is being returned on board a steamship. It was damaged by falling just after it had started to leave the water. After striking the surface it turned over on its right side. Pilot Douglas jumped, but his mechanician fell with the machine. Both escaped injury. The motor was not damaged, but other parts were broken.

Aerial Navigation Courses Given At Camp Dick

Washington, June 2nd.—The War Department announced the completion of special courses in compass adjustment and air navigation by commissioned officers in the American air service.

The Department of Military Aeronautics recently organized a school at Camp Dick, Dallas, Tex., where the two courses were conducted with British officers as instructors.

Captains S. T. Fripp, Royal Air Forces, taught the compass class. This course was designed to give engineer officers special instruction in the adjustment and compensation of aeroplane compasses, which get out of order because of the local magnetic fields set up by magnetos and engines and the jarring due to rough landings.

The course in navigation was conducted by Naval Instructor W. T. Farr, R. A. F. It consisted of instruction in air navigation or flying by dead reckoning, a method followed when the ground is not in view.

Each of the air service flying schools in this country was represented in this course by an officer who had charge of cross country flying. The officers who finished this training will now return to their respective flying fields to instruct cadets in this subject.

Summer Meeting of S. A. E. Will be Well Attended

Dayton, O.—Reservations for the Orville Wright dinner at the Dayton meeting of the would have been shown by the failure of the Society of Automotive Engineers are well over the seven hundred mark, to be held June 17th and 18th. The Standards Committee meeting and sections conference will take place on June 16th at the Dayton Engineers Club. President Kettering will act as toastmaster at the dinner. Governor Cox, of Ohio, has promised to make an address, and other speakers will be on hand.

On June 17th W. B. Stout, technical advisor of the Aircraft Board, will discuss present day problems in aeronautics. Fay B. Faurote, of the Curtiss Aeroplane and Motor Company, will talk on "Aeroplanes of Today," and F. W. Caldwell, aeronautics engineer of the Aviation Section of the U. S. Army, will give a paper on propeller design. The subject of the design of exhaust mufflers for aeronautic engines will be discussed in a paper by Archibald Black.

Reports on the International Aircraft Standards Conference, which was held recently in London, will be presented by C. M. Manly, chairman of the Aeronautic Division of the S.A.E. Standards Committee; E. H. Ehrman, chairman of the Miscellaneous Division of the S.A.E. Standards Committee, and by S.A.E. General Manager Coker F. Clarkson, who attended it on behalf of the Society, and have recently returned to this country.

A paper on "Processes of Petroleum Refining" is to be presented by C. W. Stratford, a nationally known petroleum technologist. A symposium on heavy fuel engines for automotive purposes will be participated in by P. L. Scott and C. E. Sargent, automotive engineers, who have been working on some entirely new developments in the heavy oil field.

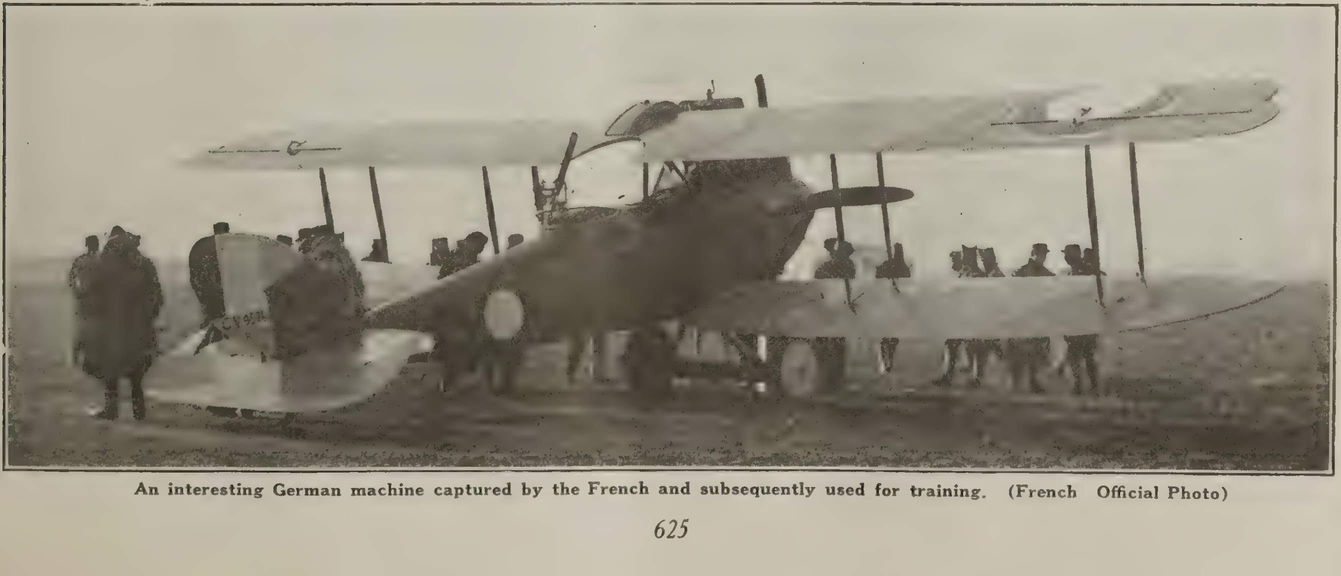
A report will be presented by the Standards Committee on the work done since last January, which has been working on the standardization of details for the Government aircraft and shipbuilding programs, specifications for tractor elements, as well as on a large number of other subjects closely connected with the design of war automotive apparatus.

Formation and night flying will be conducted by machines from the aviation fields near Dayton. It is also hoped to have on exhibition a captive balloon, of the type used for artillery direction in Europe.

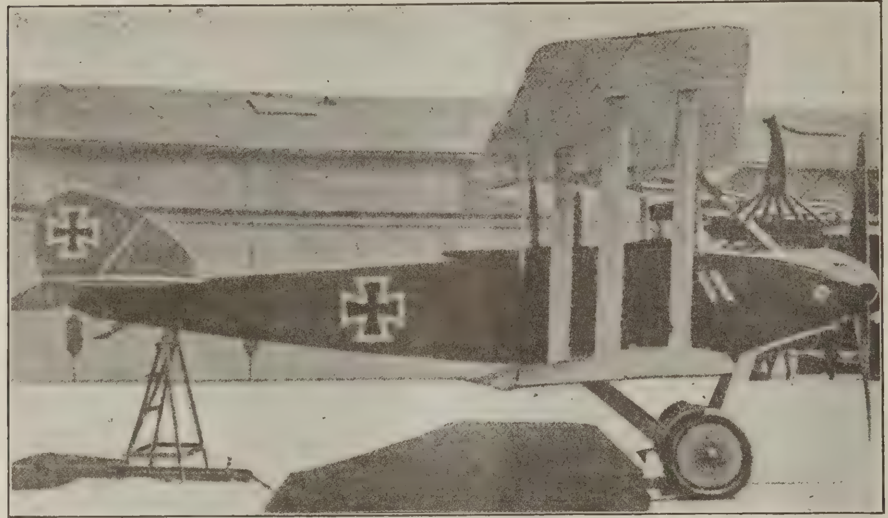
The general arrangements for the meeting are under the supervision of the Meetings Committee of the Society, consisting of David Beecroft, chairman; Herbert Chase, Fred E. Moskovics, F. E. Place and C. F. Scott. Mr. Chase is handling the securing of papers; Mr. Place the general arrangements; Mr. Scott the dinner details, and Mr. Moskovics, vice-president of Nordyke & Marmon, will supervise the reception of guests.

O. H. Fisher Addresses Automotive Engineers

Chicago, Ill.—The Mid-West Section of the Society of Automotive Engineers held its first joint meeting at Hotel Sherman on June 4th. This meeting is the first since the S.A.E. took over the technical work of the National Gas Engine Association. Following the meeting, George W. Smith, chairman of the Mid-West Section of the S.A.E., and assistant chief engineer Nash Motors Company, Kenosha, Wisconsin, presided. O. H. Fisher, president of the National Gas Engine Association, and president of the Union Gas Engine Company, Oakland, California, was one of the speakers.



An interesting German machine captured by the French and subsequently used for training. (French Official Photo)



Side view of the German A. G. O. Biplane, with its characteristic interplane strut construction

At the Army Aviation Schools

Tests conducted at Fort Sam Houston, Tex., of carrier pigeons used in co-operation with aeroplanes made recently by the Signal Corps proved a success. It has developed that pigeons can be released with a message while the aeroplane is in flight. The bird is thrown by the pilot so as to clear the machine and the immediate current of air going with it. The birds then drop until they reach the proper height for easy natural flight, when they circle about just as they do after rising when released on the ground, and start back to the loft. Pigeons used by the Government carry either a band marked "U. S. A." and a serial number, or have "U. S. Army" stamped on the wing feathers. Persons finding any such pigeons either killed, injured or penned are urged by Lieutenant Reges to notify the Department Signal Office, Fort Sam Houston, Tex., immediately.

An army dirigible, on a practice flight above the waters of Great South Bay, near New York, became stuck in the mud of a small island recently, when compelled to descend because of a sudden cloudburst and electrical storm. The harder the pilot worked, the tighter the mud took hold of the dirigible, so he gave up in despair, curled under his leather cushion and went to sleep. The next morning he arose, walked down the beach until he arrived at a coast guard station and reported his predicament. Soon afterwards, the balloon was being towed home by a patrol party.

Soldier athletes of the Aviation Corps, U.S.A., Field No. 2, at Mineola, excelled last week in the track and field meet held for the soldiers on the improvised track at Field 2 under the auspices of the New York A. C. The meet was a triangular contest between the student fliers of Fields 1 and 2 and the soldiers of Camp Mills, but the latter failed to gain a place in any of the events held, making the meet really a dual competition between the two aviation fields.

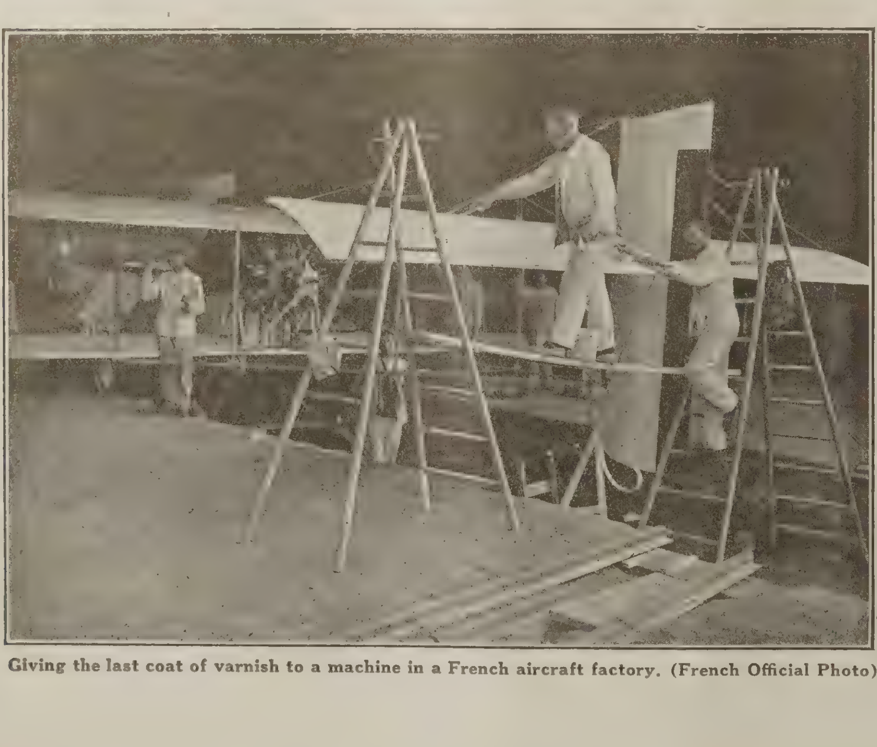
New York to Boston Aerial Mail Service Inaugurated

New York, June 3rd.—Within a few weeks after the successful inauguration of the New York to Washington Aerial Mail Service, the Post Office Department is extending the route from New York to Boston.

Lieutenant Vanel will take to the air from Army Aviation Field 1 at Mineola as early as possible this morning, so that he will have ample time to return to New York or continue his flight to Montreal. His mail packets, containing about 4,000 letters, among them messages from Postmaster General Burleson and French officials in Washington to public officials in Boston, were taken to the hangar at the field yesterday afternoon and put under guard there. He will fly in an American-built machine not equipped with a Liberty motor.

New Supervisor of Aerial Mail

Washington, June 1st.—Captain C. A. Weidenbath, of the Signal Corps, United States army, who has seen three months' service as a flier with the American forces in France, has been appointed by the War Department as supervisor of the Aeroplane Mail Service between Washington and New York, it was announced to-day. He will succeed Major Reuben H. Fleet, who has been transferred to a California flying school.



Giving the last coat of varnish to a machine in a French aircraft factory. (French Official Photo)

Aircraft Production Figures Revealed in Discussion of Army Appropriation

Washington, D. C.—Facts communicated to the Military Committee by officers of the Signal Corps and made public on May 29th, in the consideration of the $12,000,000,000 army bill, makes it possible to summarize the production of aeroplanes, their shipment abroad, and the number of aviators trained and sent abroad. The figures show that of the 22,000 aeroplanes called for in the original program adopted almost a year ago, there have been completed and put into service 5,076 machines. Of this number, 3,760 have been made and assembled in this country, and are in use here, a large proportion of them being training planes. The rest are of foreign manufacture, built largely with American materials, and in use with General Pershing's army. There are 323 combat planes among the 1,316 machines in France.

Deliveries of the Liberty engines up to date are:

For the army, 561; to the navy, 480. Total delivered, 1,041; to foreign governments, 900. A total of 3,000 Liberty motors have been ordered by Great Britain. Average price of planes, $5,000. Price of Liberty engines, $1,950 to $5,000. Total cost of planes and engines, from $6,900 to $10,000.

Life of aeroplanes in continuous service, one month.

Rate of deliveries in last week of April was: For planes, 110 primary training planes, 19 advanced training planes, 7 combat planes.

For Liberty engines, 241 primary training engines, 108 advanced training engines, 86 combat engines.

This rate of production is slowly but steadily increasing.

The total expenditures and obligations made in connection with the aviation service is now $859,839,000.

There are to-day in the armies of the United States 6,211 flying officers and 8,364 non-flying officers. Of the flying officers there were on May 1st, 1,509 abroad and 4,606 in this country. Of the non-fliers 1,854 were abroad and 6,506 in this country.

For the 1,509 fliers abroad there are 1,316 machines, or less than one machine per man, compared with a requirement, according to latest revised calculations, of six machines per man, or a total for 1,509 fliers of 9,054 machines.

There are 2,983 cadets at the flying schools in this country and 2,044 abroad, a total of 5,937.

Statements made to the House committee show that for the past three weeks a considerable number of aeroplanes have been shipped on practically every vessel leaving this country, so that the ratio between the number of fliers and machines is rapidly being overcome.

Navy Aviation Section Wants Men

New York City.—Truman E. Newberry, assistant to the commandant of the Third Naval district, issued a special appeal for the enlistment of trained men at once in large numbers for the aviation section of the United States Naval Reserve Force. Special ratings will be given men who enlist. The age limits are from 18 to 35 years. Men within the draft age can obtain permission to enlist. General machinists, automobile mechanics and assemblers, tool makers, die makers, cutters and cloth fitters, upholsterers, canvas workers, painters, tent riggers, wood workers of all kinds, toolsmiths, forge men, furnace men, coppersmith, shipfitters and all kinds of sheet metal workers are wanted. Applications for enlistment are being received at 51 Chambers street and at all navy recruiting stations.

Predicts Five-Cent Aero Mail Service

Baltimore, Md. May 27.—Second Assistant Postmaster General Praeger in a statement to a staff correspondent of *The Baltimore American and Star* predicted the following developments for the aerial mail service:

Five-cent mail service by aeroplane.

Flights between Chicago and other Middle West cities and Eastern points, and, finally, transcontinental flights.

Washington to Chicago flights in from seven to nine hours.

Establishment of flights in sections not accessible by trains.

Aerial routes where circuitous approaches, due to cañons, lakes, and other natural objects, make ordinary mail deliveries unusually slow.

Final interlocking of the entire country after the war with aeroplane mail service for letters and packages.

"We are training aviators now," he said, "with the intention of using them for the aeroplane mail service when they return from aviation work in France. By that time we believe that the service will be developed to such an extent that both men and machines will be needed for the work in every part of the United States.

"At present, it seems, the service is somewhat handicapped by being forced to use only one-engine machines."

For this reason, Mr. Praeger said, its real development could scarcely be carried out until after the war, when both aviators and three engine aeroplanes would be available. Mr. Praeger was not favorably inclined to women aviators for postal aerial work.

AMERICAN AIRMEN ON FOREIGN SERVICE

"In the course of air combats this morning our aviators shot down a hostile machine," says General Pershing's official communication of May 27th.

Lieutenant Paul F. Baer, of Mobile Ala., was posted as missing since May 22nd. Lieutenant Baer is a member of the American Flying Corps and formerly belonged to the famous Lafayette Squadron. He is one of the most brilliant American aviators and is an ace. He was cited by the French early this month, after bringing down his fifth German machine.

The news that American aeroplanes are flying in France has caused great jubilation in Paris. Dispatches from the front refer in the highest terms to Germany's new enemies in the skies, and official assurances that America has a large number of well trained airmen to throw into the struggle when a sufficient supply of machines arrives in the battle zone has created profound satisfaction.

A number of American aeroplanes late in the afternoon assisted the French infantry in fighting near Pont-au-Mousson. Swooping down over the German lines, the Americans poured an avalanche of bullets into the enemy's trenches.

May 28th

The official American communique for May 28th reports aerials operations, as well as the first extended infantry attack of our troops, in the capture of Cantigny. The text of the statement on aeronautics follows:

"Section A—Early in the day our aviators shot down a hostile machine.

"Section B.—Yesterday morning three of our planes encountered four hostile planes flying at 3,000 meters in the region of Montsec. In the fighting which ensued Lieutenant Douglas Campbell successfully attacked two of the German machines. Of these, one lost both wings and fell. This was referred to in yesterday's communique. In the same encounter one of our aviators was wounded; but succeeded in making a normal landing within our lines.

"This morning Lieutenant Rickenbacher and Lieutenant Campbell attacked a group of six enemy planes and brought one down out of control."

Lieutenant Edward V. Rickenbacher of Columbus, Ohio, and Lieutenant Douglas Campbell of California this morning forced a German biplane down out of control in the Bois de Rate, northeast of Xivray, in the Toul sector. They fought six enemy planes. The German machines encircled the American pilots and attempted to drive them behind the German lines. Rickenbacher suddenly pounced on one of the enemy planes, and Campbell, going to his assistance, managed to drive the enemy down.

May 29th

General Pershing's official communique of May 29th reports aerial successes. Section A of the report states that "it is established that on May 27th our aviators shot down two hostile machines instead of one as reported."

Section B of the statement reports the following activity:

"In the late afternoon of May 27th Lieutenants Fisher, Curtis, Buford, McLanahan, flying at 4,000 meters on patrol duty, encountered hostile planes in the region of St. Mihiel. In the fighting which ensued one of the hostile planes broke into flames and fell.

"Credit for bringing down aeroplane reported in yesterday's communique is given to Lieutenant Rickenbacher and Lieutenant Hambleton and not to Lieutenant Rickenbacher and Lieutenant Campbell as reported.

"This morning an English aviator returning from bombing expedition was wounded in the arm. He was chased by two enemy machines.

"Lieutenant Campbell drove the hostile aeroplanes off, enabling the English aviator to return to his aerodrome safely."

May 30th

The official journal of the French republic prints several citations of volunteer aviators from the United States. The fourth and fifth victories of Major William Thaw of Pittsburgh are announced as follows:

"Thaw, commander of the Lafayette Squadron, is absolutely remarkable as squadron chief, giving his pilots the finest example of courage and enthusiasm, making his squadron a unit of

(*Continued on page* 650)

The Balloon Division of the Goodyear Tire and Rubber Company recently had their summer outing. The above illustrations depict some of the activities. (1) The employees of the Balloon Division. (2) Entraining for the field. (3) Jumping the rope. (4) Watching a dirigible flight. (5) The girls' race. (6) Putting the dirigible in the hangar after the flight. (7) Helen Ratzon, Mary Cessna and Bertha Sheets, winners of the girls' race.

The AIRCRAFT TRADE REVIEW

Curtiss Company Elects Officers

Buffalo, N. Y.—At the annual meeting of the Curtiss Aeroplane & Motors Corporation held here recently, the following officers and directors were elected:

Glenn H. Curtiss, chairman of the board of directors; John N. Willys, president; James E. Kepperley, vice-president and general manager; C. M. Keys, vice president; E. C. Morse, vice-president; W. W. Moss, vice-president and comptroller; B. A. Guy, secretary and assistant general manager; J. F. Prince, treasurer; H. M. Root, assistant comptroller; J. J. Donahue, assistant treasurer; J. F. Weber, assistant secretary.

The board of directors consists of Glenn H. Curtiss, C. H. Conners, Harry Evers, B. A. Guy, C. M. Keys, James E. Kepperley, W. A. Morgan, W. W. Moss, F. R. Russell, J. Allan Smith, G. C. Taylor, J. N. Willys, Rodman Wanamaker, W. B. Stratton and J. A. D. McCurdy.

American Truck & Aeroplane Co. Buys Factory

Kankakee, Ill.—The American Truck & Aeroplane Co. has bought the plant of the Unifile Co. at Riverview, Ill., and will equip it for the manufacture of commercial vehicles and aeroplanes.

Curtiss Production Figures

Buffalo, N. Y.—In the 12 months ending April 1, 1918, the Curtiss Aeroplane & Motors Corporation manufactured and delivered 2,209 aeroplanes, according to figures published in *Automotive Industries*. In addition, the company built and delivered, 2,205 OX engines, and 389 V2 aeroplane engines, during 1917. Of the 2,209 planes, 1,376 were of the preliminary training type and 339 were for advanced training. In the total number, 31 models were included. Two types of seaplanes are being made for the government, one equipped with a single, the other with a double engine.

Goodrich Sales to Total $100,000,000

Akron, O.—According to a recent estimate, the gross sales of the B. F. Goodrich Co. will total $100,000,000 during 1918, as compared with $87,155,072 in 1917, and $55,416,866 in 1916. In the 1917 manufacturing ratio of 17.4 per cent is maintained, the company will earn between 16 and 18 per cent on the $60,000,000 common stock.

Curtiss Men Plan Club

Buffalo, N. Y.—Plant managers, superintendents of departments and formen of the several factories of the Curtiss Aeroplane & Motors Corporation located on North Elmwood, Elmwood, Niagara, Churchill, Austin and Bradley Street factories of the company have started a club for members of the organization. Erie Beach and its grounds will be leased for the summer and exclusive use of the beach, hotel, tennis courts, baseball diamond, athletic field, dance hall and other equipment will be given to the club members. After October 1st, it is planned to open a town clubhouse. The club will be maintained, officered and managed by Curtiss employees.

Changes in Curtiss Personnel

Buffalo, N. Y.—Changes in the personnel of the factory organization of the Curtiss Aeroplane & Motors Corporation have been announced as follows:

M. O'Shaughnessy has been appointed superintendent of Division B, boat final assembly, at Factory J, succeeding J. M. Lydiatt, resigned.

J. R. Hansen has been made superintendent of assembly division No. 1 of the North Elmwood factory, which consists of the following departments: Dope, Covering, Panel and Final Wing Assembly.

E. W. Nice has been appointed superintendent of the boat hull department at the North Elmwood plant, replacing Henry Kart, resigned.

Navy Announces More Contracts

Washington, D. C.—The Bureau of Supplies and Accounts of the Navy announced that contracts had been placed with the Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y., for propellers. The Goodyear Tire and Rubber Co., of Akron, Ohio, has been awarded a contract for airships.

Manly 20 Years In Aeronautics

On June 1st, 1898, Charles M. Manly, of the Curtiss Aeroplane and Motor Corporation, joined the illustrious Professor Samuel W. Langley, then secretary of the Smithsonian Institution, in his aeronautical experiments, and he has been at it ever since. Dr. Langley had written to Dr. Thurston of Cornell for a man to take charge of building a man-carrying aeroplane, which included having to secure or construct a power plant. Dr. Thurston told Mr. Manly that he was offering him the greatest opportunity he had ever had to offer to any man. He was right in his vision and wise in his selection.—H. W.

Glenn L. Martin Acquires More Land

Cleveland, O.—The Glenn L. Martin Co. has just purchased an additional tract of land adjoining its large tract where the new factory is located. The new tract, with the 57 acres acquired several months ago, gives the company about 75 acres. An additional railroad frontage of 1,100 feet on the Nickel Plate Railroad is afforded by the recent purchase. The new tract will be used as a flying field, there being a clear sweep of one-half a mile for landing.

Cleveland Pneumatic Tool Adds to New Building

Cleveland, O.—The Cleveland Pneumatic Tool Co. will erect a one-story addition to its plant, to be used as a machine shop.

Aircraft Manufacturers to Train Workers

New York, May 22nd.—In order to meet the demand for skilled workmen many manufacturers are providing means for the instruction of unskilled laborers, according to a report made to the National Association of Manufacturers, by its Committee on Industrial Education. The Curtiss Company, of Buffalo, in great need of trained workers, started a school on March 1st, occupying 30,000 feet of floor space. After six weeks, it was transferring from this training room to the factory 30 workers daily, with an immediate betterment in production throughout the factory. In cable splicing, girls, after four days' training, were doing the best work the Government inspector ever saw, and averaging 55 against 40 in the shop. Another operation took 48 minutes in the training room against 60 in the shop. There is no question there now as to labor supply and production.

The Wright-Martin Aircraft Corporation has training facilities in New Brunswick. The Standard Aircraft Company, of Elizabeth, is now in the process of providing training facilities.

Venus Pencils Make Advertising History

On May 15th, just a little before 10 A.M., the phone rang in the office of the advertising manager of the American Lead Pencil Company, 220 Fifth Avenue, New York.

"The first New York-Washington aeroplane express leaves in an hour and a half—how about running an advertisement in the Washington papers?"

"Can we make it?"

"Yes."

"Go ahead."

At 10 A.M. the advertisement was written and insertion orders made out; at 10:15 a messenger made a dash for the Pennsylvania Terminal Post Office, and he made some speed, arriving at 10:19.

"Just under the wire," remarked the mail clerk, "this mail closes at 10:20."

At 11:30 the first United States Mail Service Aeroplane left New York, reached Washington at 2:50 P.M., and the next day the first pencil advertisement to travel by Uncle Sam's fastest mail was spread broadcast.

First Aircraft Parts Catalogue

The Erie Specialty Company has just issued the first aircraft catalogue which is exclusively devoted to aircraft metal parts. The catalogue is artistically and efficiently assembled. It points out that the Erie Specialty Company has the largest plant devoted exclusively to the production of aeroplane bolts, nuts and clevis pins in the United States. Their process of manufacture has been standardized to conform to the Government specifications, with the result that they are able to turn out aeronautic bolts, nuts and clevis pins on a quantity basis. The catalogue emphasizes the good quality and dependable service which the Erie Specialty Company renders and is an excellent reference book for aircraft manufacturers.

British Make Great Strides in Aeroplane Construction

London, Eng.—Addressing the Bedford Women's Liberal Association on April 11st, Mr. F. Kellaway, Parliamentary Secretary to the Ministry of Munitions, said that the increase for the first two months of the year, compared with the first two months of 1917, was as follows: aeroplanes, 223 per cent; aero-engines, 245 per cent.

The average weekly production of aeroplanes for this year equalled the average production for two months in 1915, while in the case of machine guns, one week's production equalled that of five months' in 1915.

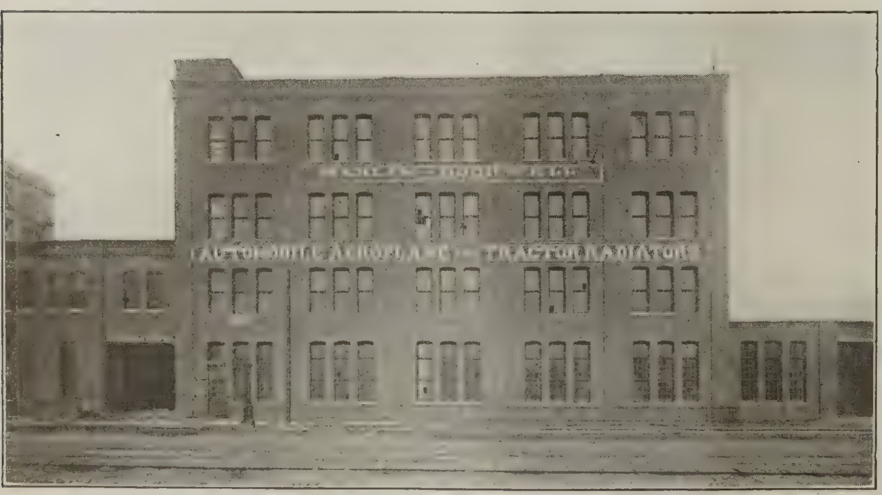
Personal Pars

C. V. Thomas has been promoted from assistant sales manager of the F. B. Stearns Co., Cleveland, to general sales manager of the company.

Victor Clark Parker, formerly manager of the technical department of the Buick Motor Co., Flint, Mich., has received the commission of major, in charge of the industrial headquarters of the Motor Mechanics Regiment of the Aviation Section. He will be stationed at Camp Greene.

"Titanine" Incorporated in New York State

Albany, N. Y.—Among the new incorporations of May 29th, announced at the office of the Secretary of State of New York, is Titanine, Inc., manufacturers of aeroplane "dopes," varnish and finishing materials, with a capital of $25,000. The incorporators are: Mr. E. G. Davis, R. S. Doubleday, E. T. Costello, of 31 Nassau Street, New York City.



The new factory of the Mayo Radiator Division of the Marlin-Rockwell Corporation at 143rd St. and Southern Boulevard, New York City.

Personal Pars

L. E. Warford, the publicity manager of the Seattle branch of the B. F. Goodrich Company, has been ordered to the School of Military Aeronautics at Berkeley, Cal., following his enlistment in the Aviation Section of the Signal Corps. Mr. Warford has acquired considerable reputation as a publicity expert, not only for his work in connection with the Goodrich Company, but also his service with the Panama-Pacific Exposition and the Pacific Lincoln Highway Association.

Quartermaster Purchases to be Made in 13 Depots

Washington. — The Quartermaster Department has designed its own system for control of purchases of quartermaster supplies. Territory has been allotted to 13 general supply depots located at various points. Each supply depot quartermaster will be charged with the duty of ascertaining manufacturing possibilities of his zone.

This plan will allow for an equitable allocation of purchases and, as far as possible, equipment for troops at the various camps will be purchased in the zone in which the camp is located. Each supply depot quartermaster will also recommend the employment of such producers as he believes are qualified to fulfill contracts. Each depot will be kept informed as to market conditions. Purchases will be made, after advertisement, by open competitive bidding whenever time permits. A record of bids received and awards made will be open to public inspection.

The states included in the zones assigned to the 13 supply depots are as follows:

Boston General Supply Depot—Maine, New Hampshire, Vermont, Massachusetts and Rhode Island.

New York Depot—New York, Connecticut and New Jersey, north of Trenton.

Philadelphia Depot—New Jersey south of Trenton and Pennsylvania.

Baltimore Depot—Maryland, Virginia and Delaware.

Atlanta Depot—North Carolina, South Carolina, Georgia, Florida and Alabama.

Jeffersonville, Ind., Depot—Ohio, West Virginia, Indiana south of Indianapolis, Kentucky and Tennessee.

Chicago Depot—Indiana north of Indianapolis, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Illinois except territory south of Jacksonville, Springfield, Decatur, and Iowa east of Des Moines and Fort Dodge.

St. Louis Depot—Missouri, Illinois south of Jacksonville, Springfield and Decatur, Kansas, Oklahoma and Arkansas.

New Orleans Depot—Louisiana and Mississippi.

Fort Sam Houston Depot—Texas.

Omaha Depot—Iowa from Des Moines, Fort Dodge and west; Nebraska, Colorado, Utah and Wyoming.

El Paso Depot—New Mexico and Arizona.

San Francisco Depot—California, Oregon, Washington, Idaho and Montana.

Aluminum Prices Fixed By War Industries Board

Washington, D. C.—The price-fixing committee committee of the War Industries Board has come to an agreement between the producers of aluminum following investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production. The new maximum base price for aluminum, effective June 1st to September 1st, shall be 33 cents per pound, f. o. b. United States producing plants, for 50 tons or over, of ingot of 98 to 99 per cent. Differentials for sheet, rod, and wire will be increased by approximately 12½ per cent; differentials for quantity and grade and differentials for alloys will remain as heretofore, i.e., those approved by the price-fixing committee of the War Industries Board on March 3rd, 1918.

The conditions upon which these prices are made are, first, the producers of aluminum will not reduce the wages now being paid; second, aluminum shall be sold to the United States Government, to the public in the United States, and to allied governments at the same maximum base price; third, they will take the necessary measures, under the direction of the War Industries Board, for the distribution of aluminum to prevent it from falling in the hands of speculators who might increase the price to the public; and, fourth, they will pledge themselves to exert every effert necessary to keep up the production of aluminum, so as to insure an adequate supply so long as the war lasts.

Auto Dealers to Release Mechanics for War Service

St. Louis, Mo.—At the meeting of the Board of Directors of the National Automobile Dealers' Association, held here on May 19th, plans were discussed for freeing as many mechanics as possible for military purposes. Several recommendations were adopted which, it is hoped, will make possible the freeing of 30,000 skilled motor mechanics for the air service and to take care of the motor trucks being used in France. The elimination of unnecessary service, of Sunday and night work, except for commercial cars, the education of mechanics to do more efficient work, the establishment of a cash basis to eliminate clerical work, the education of automobile owners to make minor repairs, reductions in number of demonstrations, are among the means proposed to reduce the number of mechanics required by the automobile dealers throughout the country.

The Italian Aircraft Industry

Nearly a dozen new companies dealing with aviation have been registered recently, many of which in the Southern Provinces.

The Società Marittima Italiana of Naples, which is an insurance firm going in for aerotransport risk policies, has become a "Società Anonima."

The firm of "Ing. Nicola Romeo & Co." of Milan, has raised its capital from ten millions to thirty millions of lire, and has become the "Società Anonima Italiana" of that name.

Ing. O. Pomilio & Co. are transferring the official headquarters of the business to the capital.

Judging by the budding of business concerns this spring, much fruit should be forthcoming by the summer.

Another of the numerous accessories now in use, and which these notes could not even in peace time adequately deal with, is the Gabbioneta four-bladed petrol pump fitted to the Caproni machines among others. The fitment has gained its place there, and so here, on its merits.

At a ceremony in the memory of the heroic Capuan Captain Oreste Salamone at that place, the High Commissary for Aviation said in his speech: "We must prefer the offensive to the defensive. Italy must be one big trench in the face of the enemy. We have to avenge Salamone and our other martyrs by silent work in preparing more arms, more aeroplanes, more men. . Southern energy and brains must be made available."

By connecting up with a tube two rectangular receptacles set at right angles to each other, and partially filled with a suitable liquid, Engineer Corrado D'Ascanio has evolved a simple foolproof lateral and longitudinal inclinometer. The receptacles are deep, long and norrow, of glass—triplex?—and lie the one transversely to the path of travel, the other parallel to it. Their sides are ruled to show deviation from the horizontal of the lateral or longitudinal axes of the machine.

The "Officine Ferroviarie Meridionali," a big company for railway material at Naples, has started an aviation department for building and repairing aeroplanes, and making spare parts for them, either in wood or metal. The company's nominal capital in 4,000,000 lire.

Another new company of some special importance in view of the development of the South is the "Aeromarittima Italiana" of Naples. Its paid-up capital is 1,500,000 lire.

The Frejus—Diatto motor firm at Turin has been taken over by the people who have so successfully launched the Pomilio concern of that city.

AEROPLANE TIRES

Although American aeroplane tire makers found some precedence established in the British aeroplane tire, they approached the manufacture of aeroplane tires as practically a brand new problem.

The requirements of the service call for the maximum tire strength possible with the minimum of weight. Aeroplane designers, necessarily jealous of every pound of weight that does not contribute directly to flight, subjected the aeroplane tire to their usual searching test of efficiency.

Besides lightness and strength, it was found that one other main requirement must be met. An aeroplane tire is subject to side crashes in landing because of the fact that an aeroplane very seldom lands directly head on. It usually alights at an angle to its line of flight. Therefore, an extra strong, specially reinforced bead is necessary to hold the tire on the rim of an aeroplane wheel.

The tire is the chief cushioning element between the aeroplane and the ground. To secure as much cushioning effect as possible, therefore, aeroplane tires are inflated to only 40 pounds—practically half the pressure in a properly inflated automobile tire.

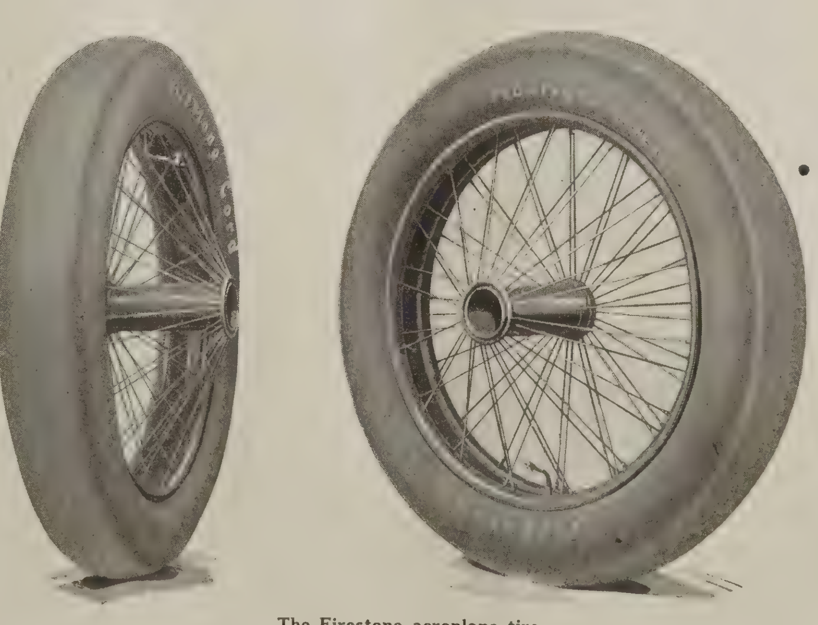
The above conditions of service resulted in the production of the Firestone Areoplane Tire—a tire of 4 ply cord contruction with a specially reinforced bead and a light tread. Although an aeroplane weighs upwards of 1,000 pounds, it was found that a 4 ply cord construction was sufficiently strong, because the weight of the aeroplane rests upon the tire during only a very short part of its flight. As soon as the aeroplane attains a speed of 40 to 50 miles an hour, though it may yet be running along the ground, the actual weight resting on the tire is very little. The only enemy of the tire at this speed is some protruding object which may give the tire a hard knock. But it has been found that the Firestone 4 ply construction is strong enough to withstand all ordinary knocks and even some of extraordinary character.

Still in the Development Stage

So rapid have been the changes in the design of aeroplanes, that the tire manufacturer would be the last to say that the aeroplane tire as it stands today is the final product. Efforts have been made at standardization, and so far the industry seems to have produced tires in two main standard sizes. The first is the 26" x 4" size used mostly on training machines. The other is the 75° x 125 millimeter (about 30" x 5"). Government specifications for aeroplane tires fix the maximum weight of the 26" x 4" tire at 8½ lbs., and the 750 x 125 at 11 lbs.

Other sizes have been agreed upon as standard, but not many tires of these sizes are in use. They are 700 x 75, 700 x 100, 800 x 150 and 900 x 200 millimenters.

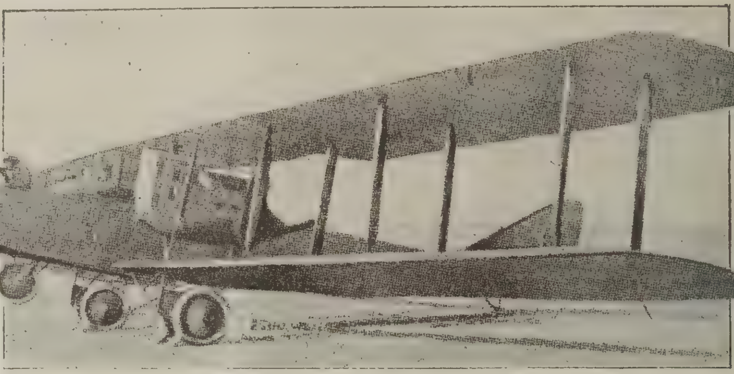
The Development Department of the Firestone Company is constantly working on all sizes and new specifications for aeroplane tires to keep pace with the constant change in the design and size of new models of aeroplanes.



The Firestone aeroplane tire

THE FRIEDRICHSHAFEN BOMBING BIPLANE

A Report issued by the Technical Department of the Department of Aircraft Production, British Ministry of Munitions


The Twin-Motored Friedrichshafen Bombing Biplane

THIS machine, which bears the mark F.D.H. G.3. 326/17, was brought down by anti-aircraft fire at Isbergues on the night of February 16th. A shell made a direct hit on the right-hand engine at a height of 8,000 to 9,000 feet, after which the machine covered about six miles and made a fairly good landing.

Various parts of the structure bear different dates, that on the tail being 14/1/18. The main spars are branded with a small crown and the letters Z.A.K. The following is painted on the side of the body:—

Leergewicht (weight empty), 2,695 kilogrammes =5,929 lbs.
Nutzlast (useful load), 1,235 kilogrammes = 2,717 lbs.
Zulassiges Gesamtgewicht (permissible total weight), 3,930 kilogrammes = 8,646 lbs.

Crew

This machine carried its full complement of four persons, namely, pilot, fore-gunner, after-gunner, and bomber. It is known, however, that the number of crew varies considerably, as some machines of this type have only carried two persons. The accommodation is so arranged that the personnel can easily change places, all the cockpits being intercommunicating.

General Description

The general design of the machine is shown in the attached drawing, which gives plan and front and side elevations.

The principal dimensions are as follows:—

Span	78 ft.
Maximum chord	7 ft. 8 in.
Gap	7 ft.
Dihedral angle in the vertical plane	1½°
Dihedral angle in the horizontal plane	6°
Total area of main planes	934.4 sq. ft.
Area of upper main planes without flap	480 “
Area of lower main planes without flap	454.4 „
Load per square foot	9.24 lbs.
Weight per horse power	16.6 lbs.
Area of flap of upper wing	21.6 sq. ft.
Balance area	1.8 “
Area of flap on lower wing	16 “
Balance area	1.56 „
Total area of fixed tail planes	57.6 “
Total area of elevators	32 „
Balance area of one elevator	1.7 „
Area of fin	20 „
Area of rudder	19.2 „
Balance area of rudder	3 „
Maximum cross section of body	19.2 „
Horizontal area of body	133 „
Vertical area of body	131.2 „
Length over all	42 ft.

The machine is built up upon a central section, to which are attached the forward and rearward portions of the fuselage and the main planes. This central section comprises the main cell or cabin of the body, containing the tanks, bombs, etc. It also embraces the engines and the central portion of the upper and lower planes. The latter, together with the engine struts, are largely built up of steel tube, as is also the landing gear.

The central portion of the body, which measures 4 ft. across by 4 ft. 3 in. in height, consists of a box formation made of ply wood, strengthened by longerons and diagonals, and transversely stiffened by ply-wood bulkheads. The bulkhead farthest forward acts as an instrument board, behind which are side by side the seats of the pilot and his assistant. The former has a fixed upholstered seat, whilst that of the latter is folding, consisting of a light steel tubular framework with a webbing backrest.

Underneath these two seats is the lower main petrol tank. Behind this cockpit the body is roofed in with ply wood, the rear part of which roofing is detachable so as to give access to the second main petrol tank, which is at the rear end of the main body section. By this means a small cabin or covered passage-way is provided, at each side of which are the racks for the smaller bombs.

Central Portion of Wings

The central and non-detachable portion of the upper plane has a span of 19 ft. 5 in., whilst at each side of the nacelle the lower plane fixed portion measures 7 ft. 8 in. The main wing spars in this central portion are of steel tube, rougly 2 in. in diameter, with a wall thickness of 1-16 in.

These spars are braced by steel tubes arranged in the form of an X, the manner in which the bracing tubes are attached to the main spars being shown in the sketch Fig 1.

The lugs are built up by welding, and are pinned and riveted in position, the joint being of the plain knuckle type.

The upper surface of the lower plane is, so far as the central section is concerned, covered in with three-ply wood.

In this portion the main ribs are of three-ply, with spruce flanges. Between each main rib is a cut-away rib, the design of which is shown in the sketch Fig. 2. This, unlike the main ribs, is one piece of wood, and not built up. For the greater part of its length it applies to the top surface only, being cut away to pass clear of the cross bracing tubes.

The plane is further stiffened with transverse members consisting of three-ply panels between each rib strengthened by grooved pieces top and bottom. The latter are attached as shown in the sketch Fig. 3, and the attachment of the flanges of the main ribs is shown in Fig. 4.

The central section of the upper main plane is in one piece and is covered top and bottom with fabric. In order to facilitate the removal of the engines, detachable panels measuring 1 ft. 11½ in. long by 1 ft. 8 in. deep are let into the trailing edge immediately over the engine bearers. These panels are socketed in front, and at the rear are joined up at the trailing edge with U section sheet steel clips and bolts.

The struts which connect the top of the nacelle to the upper plane are tubular and of streamline section, as are also the engine bearer struts. A section of one of the latter is given in Fig. 5. The thickness of the wall is one-sixteenth of an inch.

The method of attaching the lower end of the engine struts to the tubular steel spars is shown in the sketch Fig. 6, from which it will be seen that a welded Y socket is used and secured by a pin joint, the ends of the pin acting as anchorages for the attachment of the bracing wires.

This sketch also shows the lugs which respectively support the detachable portion of the main planes and the vertical strut of the landing chassis. The engine bearer struts are pushed into the Y socket and pinned in position, the pins being afterwards brazed into the socket. At their upper ends the engine struts are fixed to the top plane spars with pin joints, as shown in Figs. 7 and 8, the attachment differing according to the number of wire bracings that are to be taken to each joint.

Construction of Wings

The detachable portions of the wings are fixed to the centre section by pin joints, one part of which is shown in Fig. 6, the male portion being represented in Fig. 9. The chord of the wing in the line of flight varies from approximately 7 ft. 8 in. to 7 ft. 5 in., and the wing section is shown shaded in Fig. 10. In order to provide a basis of comparison the R.A.F. 14 wing section is superimposed and drawn to the same scale.

The main spars are placed one metre apart, the front spar being 272 mms. in the rear of the leading edge. Both spars are of the built up box type, as shown in Figs. 11 and 12. The former is the leading spar and the latter the rear spar. These spars are of spruce, and each half is furnished with several splices, so that the greatest single length of timber in them is not more than 14 ft. The splices, which occur in each half alternately, are of the plain bevel type about 15 in. long and wrapped with fabric. A fabric wrapping is also applied at short intervals along the spar.

Internal cross bracing between the main spars is afforded by steel tube cross members and cables attached as shown in the sketch Fig. 9.

The main spar joint consists of a steel plate 19 mms. thick embedded in the spar end and held in position by 5 bolts, which pass through a strapping plate surrounding the end of the spar. This plate also carries the attachment for the bracing cable and is furnished with a spigot which locates the bracing tube. It will be seen

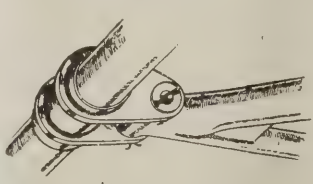


FIG 1.

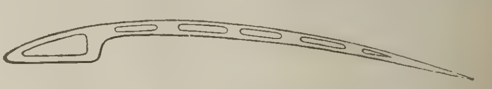


FIG. 2.

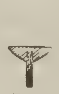


FIG. 4.

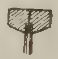


FIG. 3.

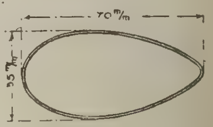
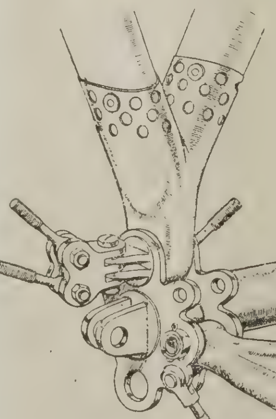


FIG 5.



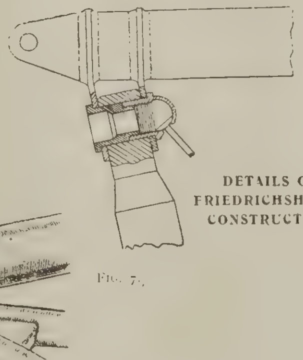


FIG. 7.

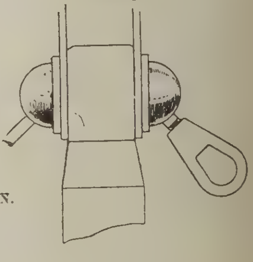
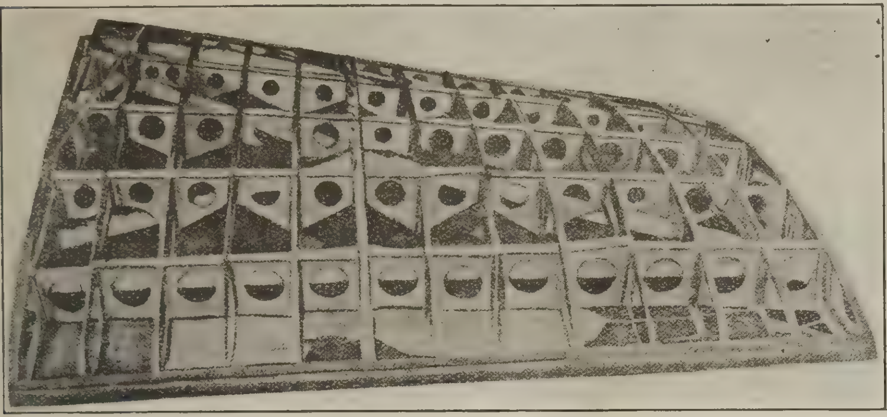


FIG. 8

DETAILS OF FRIEDRICHSHAFEN CONSTRUCTION.



Centre section of lower main plane with three-ply surfacing removed

that at this point the spar is provided with tapered packing pieces of hard wood glued and held in position by fabric wrapping.

The main ribs are placed 360 mms. apart. Between them are auxiliary formers, consisting of strips of wood 20 mms. × 10 mms. thick, which run from the leading edge to the rear spar. The main ribs consist of ply wood webs socketted into grooved spruce flanges, which are tapered off as shown in Fig. 4, except where they are met by a longitudinal stringer. The leading edge is solid wood moulded to a semi-circular section of approximately 65 mms. diameter. Where the rib web abuts against it, packing pieces are glued each side. Between the main spars the web of the rib is divided by three vertical strips into four panels and in each of these it is perforated, leaving an edge all round about 72 mms. wide.

As shown in Fig. 9, the upper flange of the main ribs is carried clear of the leading spar by means of packing pieces. In the case of the rear spar, packing pieces are also used under the rib flange as shown in Fig. 12.

The lower main planes for a width of about 2 ft. 3 in. at their inner end are covered as to their top surfaces with three-ply wood.

The interplane struts are attached to the main spars by joints of the type shown in Fig. 14. This, it will be seen, follows the typical German practice of partially universal jointed mountings for the cable attachments. At the points of attachment of these strut joints, suitably tapered packing pieces of hard wood surround the spars, which at these points are also wrapped with fabric.

Struts

Outside of the centre section the interplane struts are of wood built up, as shown in the section Fig. 15, of five separate pieces. The curved portions are of timber which has not yet been identified, but is apparently of poor quality. The cross web is of ash. The strut is wrapped at frequent intervals with strips of fabric and is fitted with a socket joint of the type shown in Fig. 16. The outer pair of struts are of smaller section than the main struts, but are built up in a similar manner. Their section is 125 mms. × 40 mms.

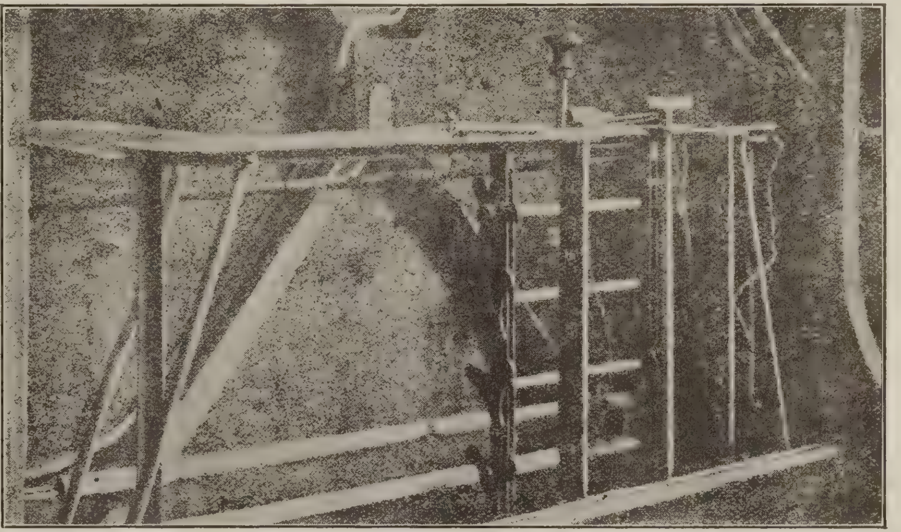
Ailerons

The framework is principally of welded steel tube wrapped with fabric.

A notable point is the thick section of the leading edge of the balanced portion, as shown in Fig. 17.

Fin and Fixed Tail-Planes

The framework of these is steel tube and in the case of the tail-planes wooden stringers running fore and aft are arranged at intervals. The tail-planes are supported by diagonal steel tubes of streamline section, on the under side of which sharp steel points are welded to prevent these stays being used for lifting purposes.



View of the bomb rack in the fuselage

Elevators and Rudders

The framework in each case is of steel tube, the main tube being 35 mms. in diameter and the remainder 15 mms.

Gravity gasoline tank set into the centre section of the upper plane. Its fabric cover is held down by press buttons. Note the detachable panel in the trailing edge of the plane

Bracing

Throughout the wings, both internally and externally, the bracing is by means of multistrand steel cable.

Fuselage (Rear Portion)

At the after-gunner's cockpit the section of the fuselage has a rounded top, which is gradually smoothed down into flat. The section, for the greater part of the length, is rectangular, and the frame is built up in the usual manner with square section longerons and verticals, the joints being arranged as shown in Fig. 18. The cross bracing wires along the sides, top, bottom, and diagonal are of steel piano wire and are covered with strips of fabric, as shown in this sketch, where they lie adjacent to the fabric fuselage covering.

The vertical and horizontal compression members are located by spigots. The joint consists of a plate which completely surrounds the longerons, its two ends being riveted together to form a diagonal bracing strip. For the last few feet at the tail the fuselage is covered with thin three-ply.

The fuselage is covered with fabric, which is held in position by a lacing underneath and is consequently bodily removable.

The floor of the after-gunner's cockpit is elevated above the bottom of the fuselage. Immediately underneath this cockpit is a large trap-door, shown by dotted lines in the plan view of the aeroplane. This is hinged at its rearward end and furnished with two large celluloid windows. It is held in its "up" position by a long spring and a snap clip. No means could be found by which it could be fixed in its closed position. As footsteps are provided for all the cockpits, this trap-door is evidently not intended for ingress and egress. It could be employed in connection with a machine-gun firing backwards, as in the Gotha, but no machine-gun mounting was fixed in this machine for this purpose.

The rear portion of the fuselage is attached to the centre section of the body by a clip at each corner. This is shown in Fig. 19. The rear portion carries a male lug, which engages with the two eyes, and is held in position by a ⅜ths bolt. Four other bolts in tension pass through the sheet metal clip, as shown in the sketch. In each case the lugs are furnished with sheet steel extensions which, as shown in the sketch Fig. 19, are sunk flush into the top and bottom surfaces of the fuselage longerons and are there held with three bolts. The corner joint is welded sheet steel, and there is an additional diagonal sheet steel point which serves the secondary purpose of providing an anchorage for the bracing wires.

As this fuselage joint is level with the plane of rotation of the propellers, it is armoured both on the nacelle and on the rear portion of the fuselage with a hinged covering of stout sheet steel lined with felt. A plate of armour a foot wide also extends down each side of the nacelle at this point.

Forward Cockpit

This is attached to the main body by four bolts with clips similar to those just described. It consists of a light wooden framework, covered throughout by three-ply.

The cock-pit can be divided off from the main cockpit by means of a fabric curtain. Its occupant is provided with the folding seat, and manages a gun and the bomb-dropping gear.

Engine Mounting

The engine bearers have the section shown in Fig. 20, and are each built up of two pieces of pine united by tongues. On their top surface they are faced with ply wood, and at the bottom with ash. A strip of ash applied to the upper outer corner of the bearer gives it an "L" section, and has screwed into it the threaded sockets for the set screws of the lower part of the engine fairing. The engine bearers taper sharply at each end. They are mounted on the "V" struts by means of acetylene welded brackets, constructed as shown in sketch, Fig. 21. These, it will be seen, are of box form, and form a liner round the streamline tube.

The engine cowling is a particularly fine piece of work, and two views are given in sketches 22 and 23. The lower portion is attached to the engine bearers by set screws, but the upper part is readily detachable, being furnished with turn buttons. This cowling allows the cylinders of the engine to be exposed to the air. A large scoop is placed in front, so as to permit a free flow of air over the bottom and sides of the crankchamber, whilst at the rear three large trumpet-shaped cowls are provided so that a draught of air is forced against the crankcase in the neighborhood of the carbureter air intake. In the rear the fairing abuts against the propeller nave, whilst in front it is attached to the radiator. It will be noticed that at each side of the radiator are narrow air scoops, the object of which is to promote a draught past the oil tank and front cylinder heads.

Engines

The motors are the standard 260-h.p. Mercedes with six cylinders in line. Full details of this engine have been published, and it is only, therefore, necessary to notice one or two points in connection with the installation.

A new departure is the interconnection of the throttle and ignition advance controls. This is carried out in the manner illustrated diagrammatically in Fig. 24. It will be seen that a considerable movement of the throttle can be made independently of the ignition advance. In the Mercedes carbureter the throttle is so arranged that it cannot be fully opened near the ground without providing too weak a mixture, and it is thought possible that the full ignition advance is not obtained until this critical opening is reached.

On several German bombing aeroplanes grease pumps for lubricating the water spindle have been found. Fig. 25 shows the design as fitted to the Friedrichshafen. It consists of a ratchet and pawl operated grease pump, secured by a bracket to one of the engine struts, and worked from the pilot's cockpit by a lever, and a stranded steel cable pasing over a pulley, the pawl being returned by a long-coiled spring.

The engine numbers are respectively MN.-32299 and MN.36228.

The exhaust pipe is of new design, although it incorporates the well-known expansion joints attached to the flanges. It is fitted with what amounts to a rudimentary silencer, whereas in previous machines of a similar type to the Freidrichshafen an open-ended exhaust pipe was used.

Radiators

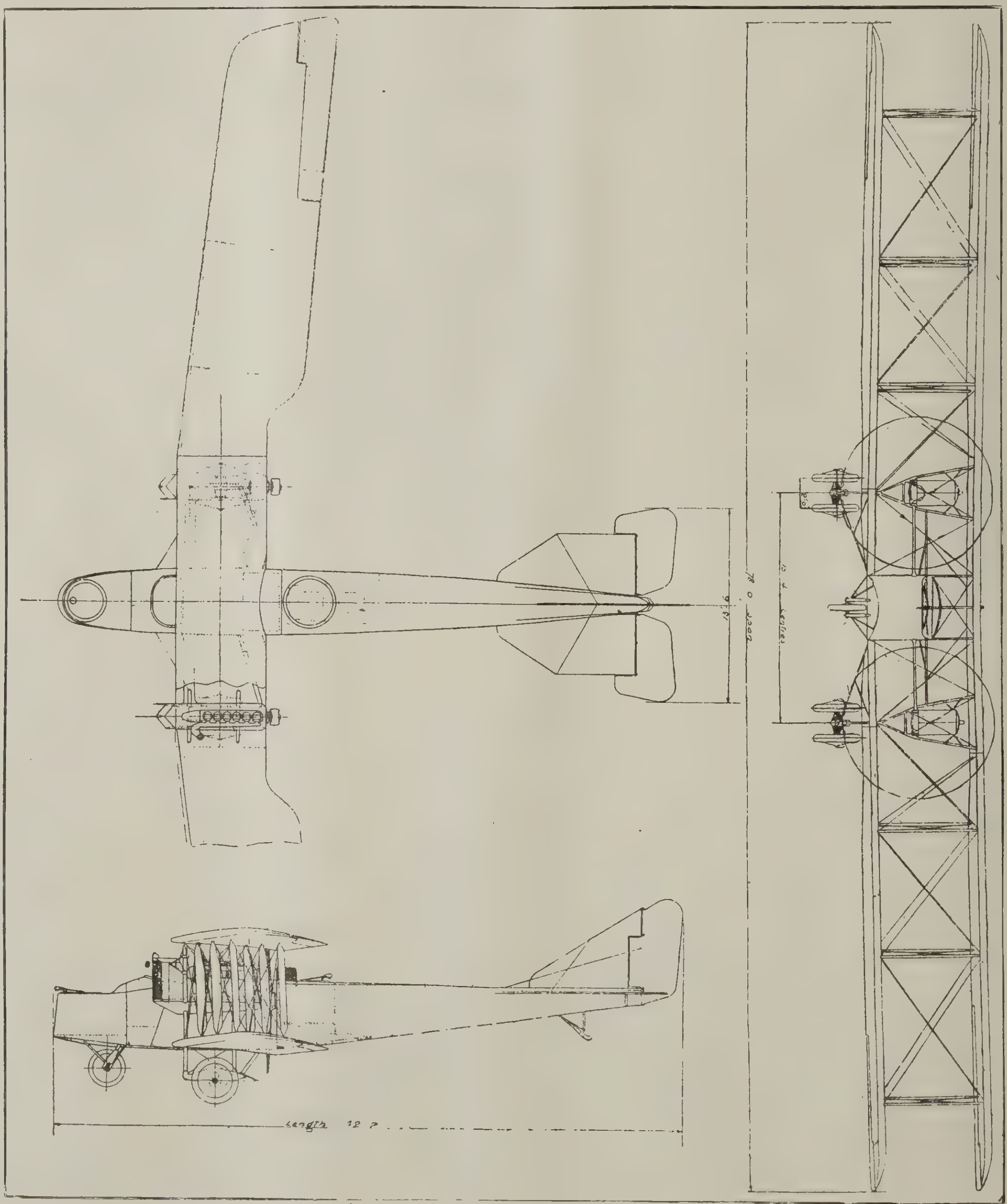
Each radiator is provided with an electric thermometer fitted into the water inlet pipe, as shown in sketch, Fig. 27, these thermometers being wired up to a dial on the dashboard, which is furnished with a switch, so that the temperature of either radiator can be taken independently.

The radiators consist of square tubes to the number of 4,134, and measuring roughly 6 mms. each way.

The radiator block is V shaped in plan, and each is provided with a shutter which covers up a little more than a third of the cooling surface. This shutter is fitted with a stop, so that when fully opened it lies in the line of flight of the aeroplane. It is opened or closed according to circumstances by the gear, shown in the sketch, Fig. 26, of which the handle is mounted on the roof of the nacelle, immediately behind the pilot's seat. Three positions are provided for the handle, which operates the two shutters simultaneously by means of return cables.

Immediately above the main radiator, and let into the upper main plane between the front spar and the leading edge, is a small auxilliary tank, illustrated in Fig. 28. This is furnished with a trumpet-shaped vent in the direction of the line of flight, and is furnished with two outlets, one to the head of the main radiator, and the other to the water pump. The function of this tank is evidently to prevent the pump from priming.

(To be continued)



Line Drawings of the Twin-Motored Friedrichshafen Bombing Biplane

CALCULATION OF STRESSES IN AEROPLANES

By S. E. SLOCUM, Ph. D.

(Concluded from page 539)

SECTION 3

Fuselage Stresses

THERE is apparently quite a variety of designs used in the construction of the body, or fuselage, of aeroplanes, but on analysis it is found that so far as the structural features are concerned the various forms of fuselage may be divided into three general types, namely,

The girder type;
The monocoque, or cylindrical shell type;
The combined girder and monocoque type.

Of these three types, the first is the most common, especially in this country, and is the form of construction used in the biplane analyzed in this series of articles.

As apparent from Figure 14, the fuselage of this machine consists of longitudinal members running the entire length of the body, connected by struts and ties so as to form trusses in both the horizontal and vertical planes. The truss shown in Figure 14 is known as the Linville or N type. The Warren truss, often used in bridge work, is also frequently used for fuselage trusses.

When the machine is in the air, both the front and tail portions of the fuselage constitute cantilevers projecting in opposite directions from the center of support. As the method of calculating the stresses is the same for both portions, only the tail portion of the fuselage will be analyzed in this article.

Amount and Distribution of Dead Load

The weights and dimensions needed for the calculation of dead loads are as follows:

Framework	Longitudinals from Station I to V	1″ x 1″ spruce
	Longitudinals from Station V to XII	1¼″ x 1¼″ ash
	Cross frames from Station I to VI	1″ x 1″ spruce
	Cross frames from Station VI to XII	1¼″ x 1¼″ ash
Areas of control surfaces and fins.	Fixed horizontal fin	25 sq. ft.
	Elevators (two)	20 sq. ft.
	Vertical fin	5 sq. ft.
	Rudder	10 sq. ft.
Unit weights.	Spruce	25 lbs./cu. ft.
	Ash	38 lbs./cu. ft.
	Control surfaces and fins	0.5 lb./sq. ft.
	Fuselage covering	0.75 lb./sq. ft.
	Cowl assumed as	5 lbs./panel
	Wires, turnbuckles and connections	3 lbs./panel
Total weights.	Horizontal fin, 25 x 0.5	12.5 lbs.
	Elevators, 20 x 0.5	10 lbs.
	Vertical fin, 5 x 0.5	2.5 lbs.
	Rudder, 10 x 0.5	5 lbs.
	Rudder post	10 lbs.
	Tail skid	5 lbs.
	Cockpit load, assumed as	
	Aviator 160 lbs.	
	Control 20 lbs.	
	Seat and flooring 20 lbs.	200 lbs.

For the tail portion of the fuselage the total dead loads carried at the various panel points, or stations, may then be tabulated as follows:

Distribution of Dead Loads.

Dead weights of	Stations						
	I	II	III	IV	V	VI	VII
Longitudinals	0.7	1.4	1.6	1.7	1.9	4.8	3.3
Cross frames	...	0.7	1.0	1.1	1.4	2.4	4.1
Wires and con.	3	3	3	3	3	3	3
Covering	0.3	0.7	1.1	1.2	1.5	1.6	1.5
Cowl	...	...	...	5	5	5	5
Horizontal fin	5	7.5	...	...	...	...	...
Elevators	10	...	...	...	...	...	...
Vertical fin	1	1	0.5	...	...	...	...
Rudder	5	...	...	...	...	...	...
Rudder post	10	...	...	...	...	...	...
Tail skid	5	...	...	...	...	...	...
Cockpit load	...	...	...	...	...	100	100
Total dead load	40	14.3	7.2	12	12.8	116.8	116.9

Wind Loads

The principal load on the rear fuselage trusses is that due to the wind pressure acting on the fixed horizontal tail fin, or stabilizer, and on the movable control surfaces or elevators. In determining the wind loads on these surfaces it is necessary to take into account their maximum inclination to the direction of motion at the maximum speed of the machine. Recent U. S. Government specifications required that the tail portion of the fuselage be designed under the following conditions:

Angle of incidence of fixed horizontal fin, — 6 degrees;
Angle of incidence of elevators.......... —20 degrees.
Air velocity equal to maximum speed of machine.

Under these conditions the factor of safety was specified as not less than 2.5. This factor was intended to cover structural requirements only, as the angles of incidence specified are such as to provide for the maximum wind loads.

The most reliable data from which to determine air pressures are those resulting from Eiffel's experiments.*

Eiffel's method consisted in first determining the pressure on flat plates normal to the wind, the final result under these conditions being expressed by the formula

$$P = 0.0033\ A\ V^2$$

where P = normal pressure in lbs./sq. ft.
A = area of surface in sq. ft.
V = velocity of wind in miles/hour.

In the present case the maximum velocity of the machine is approximately 60 miles per hour. For this velocity the maximum normal pressure as given by the above formula is found to be

$$\frac{P}{A} = 11.88 \text{ lbs./sq. ft.}$$

For an inclined surface, the pressure has been determined by Eiffel for plates of various aspect ratios and angles of incidence in terms of the pressure on the same plate when placed normal to the wind. In the present case the fixed horizontal fin has an aspect ratio of about 3 to 1, and the angle of incidence is specified as 6 degrees. Under these conditions the pressure as determined by Eiffel's experiments is given as

Max. pressure $= 0.31\ P = 0.31 \times 11.88 = 3.68$ lbs./sq. ft.,

and consequently we have

Max. wind load on horizontal fin $= 3.68 \times 25 = 92$ lbs.

This wind load may be considered as distributed between Stations I, II, and III, one-fourth, or 23 lbs., being carried at Station I; one-half, or 46 lbs., at Station II, and the remaining one-fourth, or 23 lbs., at Station III.

For the elevators the aspect ratio is about 1.5 to 1, and the angle of incidence is specified as 20 degrees. Under these conditions the pressure as determined from the same set of experiments is given as

Max. pressure $= 0.82\ P = 0.82 \times 11.88 = 9.74$ lbs./sq. ft.,

and consequently we have

Max. wind load on elevators $= 9.74 \times 20 = 195$ lbs.

This wind load is all carried at Station I.

The total loads carried at the various panel points or Stations are then as follows:

I	II	III	IV	V	VI	VII
40	14	7	12	13	117	117
195	46	23				
23						
258	60	30	12	13	117	117

Since each of the two side trusses carries half the load, the panel loads carried by one truss are half the above amounts. Hence assuming the nearest round number or integer, the final distribution of loads may be represented as shown in Figure 15.

Note that the wind loads occur at the top panel points, while the cockpit loads occur at the bottom panel points. The dead loads should in reality be distributed between the top and bottom panel points, but since they are all comparatively small, they are placed at the top panel points except at Stations VI and VII, where they are included with the cockpit loads. The effect of placing the dead loads at the top panel points is to increase the stresses in the web members.

Analytical Calculation of Stresses

The stresses in the members may be calculated either analytically or graphically. Both methods will be explained in what follows, as the analytical methods is probably more familiar and has the advantage of making it possible to calculate the stress in any one member independently of the others; while the graphical method has the advantage of showing at a glance the relative proportion of stress in the various members. In the present case the graphical analysis is easier to apply on account of the inclination of the upper and lower chords.

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*Eiffel; Resistance of the Air and Aviation, pages 36 and 118.

In analyzing a truss graphically, the most convenient notation is to place letters in the spaces between the members instead of at the joints. The letters on opposite sides of any member then indicate this member. The advantage of using this notation is that the letters indicating any member will occur at the ends of the corresponding line representing the stress in this member on the stress diagram. To avoid confusion, this notation will be adopted in the analytical calculations as well as the graphical analysis so that the same letters will refer to the same numbers throughout.

When the machine is in the air, only one set of diagonals is in action as indicated in Figue 15. The opposite set of diagonals carry the load when the machine is resting on the ground or taxying. The loads in this case are in general considerably less than when the machine is in the air, except possibly in case the machine should light violently on the tail skid. Provision may be made for this case in calculating the ground stresses by assuming that the impact load is twice the actual dead load.

From Figure 14 it is apparent that the wire diagonals intersect practically on the center line of the longitudinals. In calculating the stresses, therefore, they are figured from a skeleton diagram constructed on the center line of the members. The effective dimensions for the calculation of stresses are then as shown on Figure 15.

The stresses in the longitudinals, or chord stresses as they are called, may be found by taking a vertical section through the given member and applying the principle of moments. Before proceeding with this, however, it will be necessary to determine the inclinations of the upper and lower chords, which are as follows:

Inclination of upper chord to horizontal,

From Stations I to VI ....2°
" " VI to VII ....1° 55′
" " VII to VIII.......1° 32′

Inclination of lower chord to horizontal,

From Stations I to VI ....3° 10′
" " VI to VII ....2° 52′
" " VII to VIII.......1° 32′

Now to find the stress in any member, say *FQ*, Figure 15, pass a vertical section through this member and consider the portion on the left of the section. Taking the point 3 for center of moments, the sum of the moments of the external forces with respect to this point is

$$\text{Sum ext. mom.} = 130 \times 12 + 30 \times 10 + 15 \times 8 + 6 \times 5.5 + 7 \times 3 = 2034 \text{ ft. lbs.}$$

Since the distance between the points 1 and 3 is 26 inches, the lever arm for *FQ* with respect to the point 3 is 26 × cos. 1° 55′ = 25.984 inches.

Therefore

$$FQ \times 25.984 = 2034 \times 12,$$

whence

$$FQ = 940 \text{ lbs. tension.}$$

To find the stress in the lower chord *AP*, take a vertical section cutting *AP* and choose the point 1 as center of moments. The external moment with respect to this point will then be the same as above, namely, 2034 ft. lbs. Moreover, since *AP* has very nearly the same inclination to the horizontal as *FQ*, the lever arms will be practically the same for both, and consequently the stress in *AP* will also be of the same amount, namely, 940 lbs., but compression instead of tension.

Similarly, to find the stress in *RV*, take the center of moments at the point 2, giving the equation

$$RV \times 28.5 \times \cos. 2° 52' = 2654 \times 12,$$

whence

$$RV = 1120 \text{ lbs. compression.}$$

By this method of sections, the lower chord stresses may be found by taking centers of moments at upper chord panel points, and the upper chord stresses by taking centers of moments at lower chord panel points.

In finding the web stresses, consider first the diagonals. To find the stress in any diagonal, say *QR*, take a vertical section through this panel. Then applying the condition

$$\text{Sum of vertical forces} = O,$$

since the inclination of *QR* to the vertical is found to be 48 ° 1′, we have

$$130 + 30 + 15 + 6 + 7 + 60 = FQ \sin 2° + RV \sin 3° 10' + QR \cos. 48° 1'.$$

From the previous calculations we have

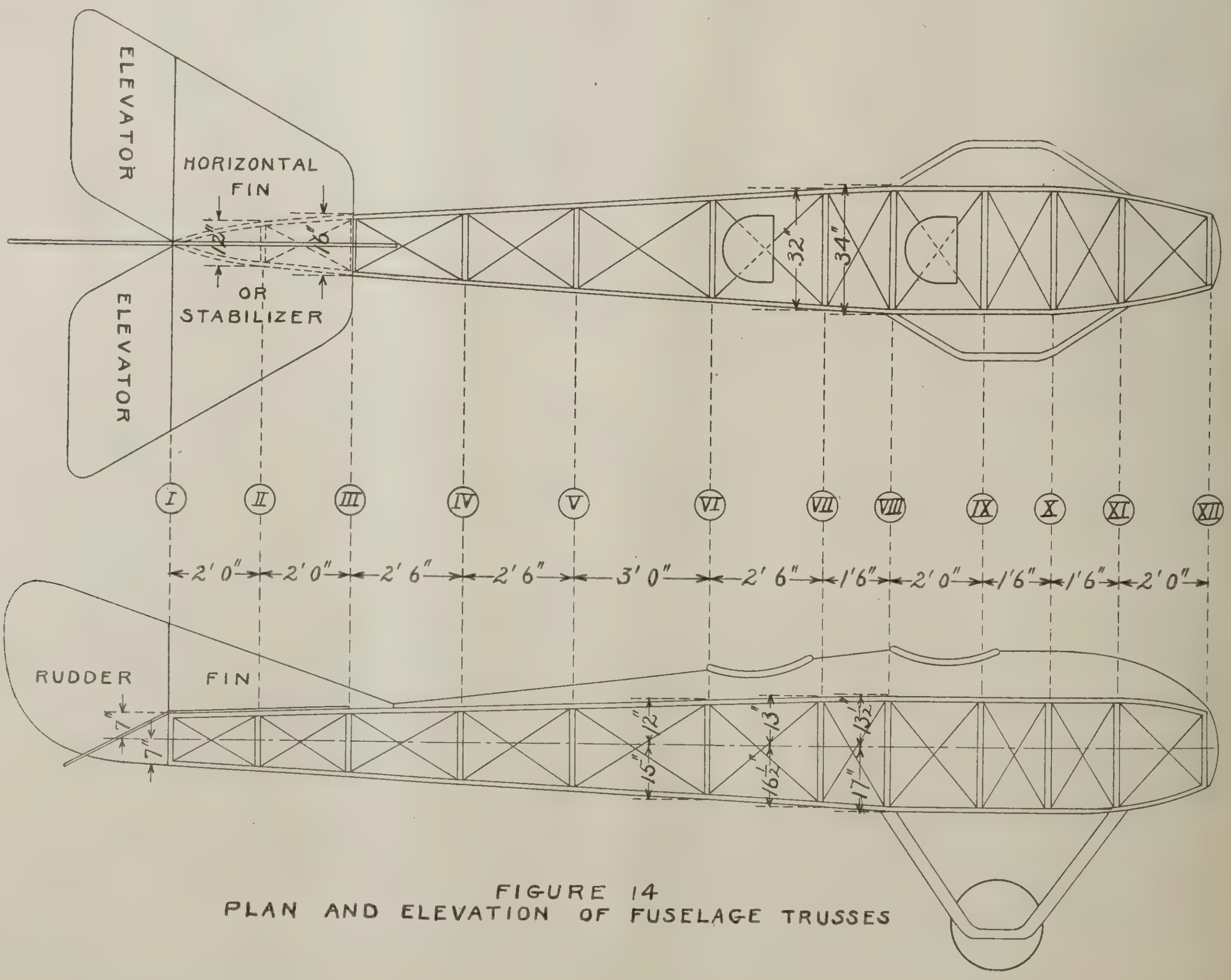


FIGURE 14
PLAN AND ELEVATION OF FUSELAGE TRUSSES

$FQ = 940$ lbs. and $RV = 1120$ lbs.

Substituting these values in the above equation, we have, therefore,

$QR = 240$ lbs. tension.

The stresses in all the other diagonals are determined in a similar manner.

To find the stress in any vertical, say PQ, take a diagonal section cutting this vertical the upper chord FQ and the lower chord AP. Then from the condition

Sum of vertical forces $= O$,

we have the equation

$$130 + 30 + 15 + 6 + 7 = FQ \sin 1^\circ\ 55' + AP \sin 3^\circ\ 10' + PQ,$$

whence, by substituting the values found above for FQ and AP we find

$PQ = 105$ lbs. compression.

The stresses in the other verticals are found in a similar manner.

Graphical Calculation of Stresses

The graphical analysis of stresses in a truss depends on the principle that if any member of forces meeting in a point equibibrate, then if these forces are laid off to scale in succession, they must form a closed polygon. If the directions of the concurrent forces are known, this principle therefore makes it possible to determine the amount of any two of them; that is to say, it determines the length of two sides of the force polygon corresponding to the point considered.

Beginning at the left end of the truss (Figure 16) it is evidene that the stress in the end post AG is equal to the load of 130 lbs. or AB, and that the stress in BG is zero.

Now proceeding to the lower panel point, we have three forces meeting in this point, namely, AG, GH, HA, one of which, AG, = 130 lbs., is known. Therefore, laying off AG to scale and forming a force triangle by drawing the lines GH and AH parallel to the corresponding members of the truss, their point of intersection H is determined, and by scaling off the length of these lines it is found that $AH = 205$ lbs. and $GH = 235$ lbs.

Next pass to the upper panel point where the load of 30 lbs. is applied. Of the five forces meeting in this point, three have been determined and two are unknown. In laying off the force diagram for any point, it is always necessary to take the forces in order around the point. Starting, therefore, with HG and moving clockwise around the point, the forces HG, GB, and BC are already laid off on the force diagram. Therefore from C draw a line parallel to the member CI, and from H draw a line parallel to the member HI, thereby determining the point I. Then scaling off the length of the two sides so determined, we find $HI = 140$ lbs. and $CI = 205$ lbs.

Proceeding in this manner by taking the joints in succession and following the zig-zag course indicated by the web members, we finally obtain the complete stress diagram as shown in Figure 16. This is called a Maxwell diagram.

Sizes of Members

In order to determine the stresses in the fuselage trusses it was necessary to assume the dimensions and weights of the members. It is now possible to check up on the design by finding the factors of safety of the various members. If these are found to be either too large or too small it will be necessary to change the dimensions of the corresponding members, but as the dead loads are small in comparison with the wind loads, a slight change in the size of the members will not materially affect the stresses.

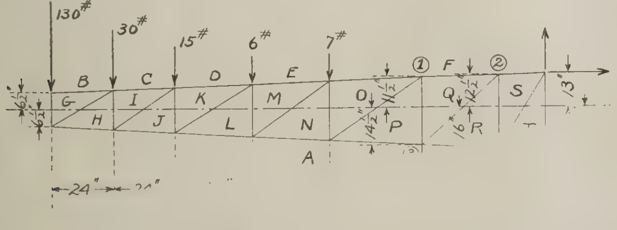


Fig 15. Skeleton diagram of fuselage truss

Consider first the diagonals. These are of piano wire for which the ultimate strength is specified as not less than 250,000 lbs./sq. in. Assuming three different sizes of wires, the breaking loads corresponding to these diameters and the safe loads for a factor of safety of 5 are then as follows:

Diameter in inches	Breaking load in lbs.	Safe load in lbs.
0.08	1250	250
0.09	1600	320
0.10	2000	400

Referring to the stress diagram, it is evident that all the diagonals from the end to and including QR may be made of wire 0.08" in diameter, and ST of wire 0.09" in diameter.

Proceeding to the compression members, the longitudinals and cross frames are made of spruce for the smaller stresses, and of ash for the larger. The strut formula given in section 1 of this article, however, applies to spruce only. Another strut formula is therefore required which applies to ash as well as to spruce. There is an English formula which applies to both materials, based on a modified form of Rankine's column formula, and which is as follows:

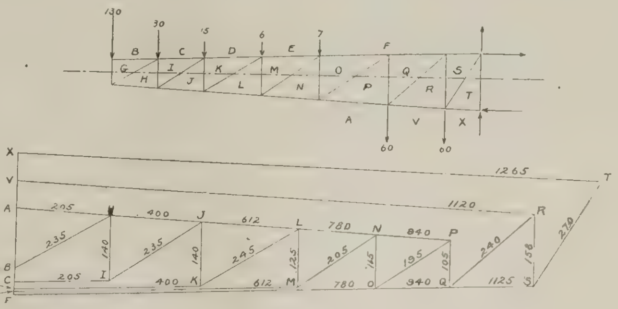


Fig. 16. Graphical analysis of stresses in fuselage truss

$$\frac{P}{A} = \frac{b}{l + c}\left(\frac{l}{\ }\right)^2$$

where P = breaking load in lbs.
A = area of cross section in sq. in.
l = length in inches
k = least radius of gyration in inches
b and c are empirical constants

The values of the empirical constants b and c for pin jointed struts have been experimentally determined as follows:

For spruce, $b = 5{,}600$
For ash, $b = 6{,}250$

The value of c depends on the ratio l/k and in the original derivation of the formula is shown graphically on a chart. The following values taken from this chart cover the range to which the formula applies.

	Values of 1/c	
l/k	Spruce	Ash
60	11,000	10,000
80	10,000	9,000
120	8,000	7,000
160	6,500	5,000
200	5,000	4,000
240	4,000	3,000
280	....	2,800

Now the member AP is made of ash of dimensions 1¼" x 1¼" x 36". Consequently $k = 0.36"$ and $l/k = 100$, and substituting in the above formula the breaking load is found to be 4,330 lbs. Since the actual compression carried by AP is 940 lbs., this gives a factor of safety of 4.6.

The member RV is also made of ash of dimensions 1¼" x 1¼" x 30". Hence $k = 0.36"$; $l/k = 83.3$, and from the formula, $P = 5{,}500$ lbs. Since the load carried by the member is 1,120 lbs., the corresponding factor of safety is 4.9.

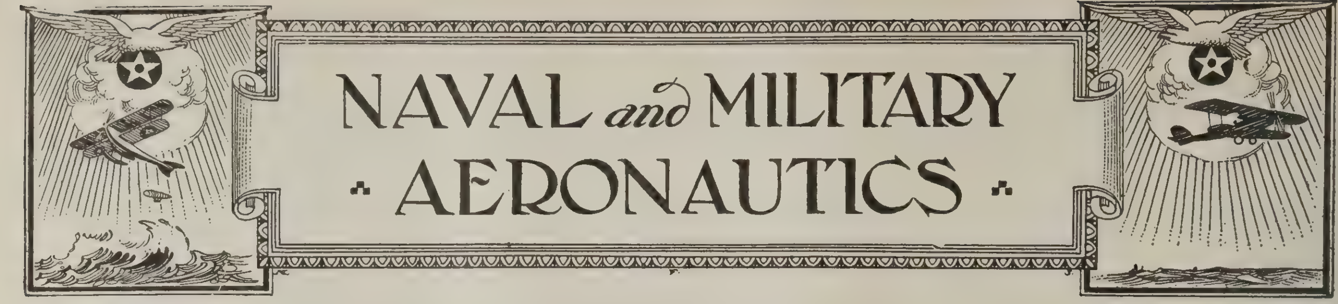
Again, the member NA is made of spruce, 1" x 1" x 30", for which $k = 0.289"$ and $l/k = 104$. The breaking load is therefore 2,550 lbs., and dividing this by the actual load, 780 lbs., the factor of safety is 3.3.

The sizes of the other compression members may be checked in a similar manner.

The formula from which these results are obtained is based on the assumption that the struts are pin jointed. As the longitudinals are continuous throughout, they can, of course, carry a greater load than if pin connected at the panel points. As it is difficult to determine just how much the effect of stiff joints increases the strength of the members, it is customary to proceed as above with the understanding that this method gives the lower limit of the factor of safety, and that the longitudinals are actually somewhat stronger than appears from the calculations.

In addition to the analysis for vertical loads, given above, the tail portion of the fuselage must be designed to carry the horizontal loads produced by steering or by a side wind striking the rudder and vertical fin; and also to carry the torsional strain produced by the action of the empennage in balancing the torque of the propeller. The horizontal loads are relatively small, however, as compared with the vertical, and the stresses produced by them are taken up by the horizontal web system shown in plan in Fig. 14. The effect on the longitudinals is to produce a small increase in compression in the bottom longitudinal of the leeward truss.

The torsion effect is taken care of by wire diagonals passing obliquely from the upper left hand corner of one side panel to the lower right hand corner of the opposite side panel.



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BRN—Report to Bakers Field, Rochester, N. Y.
BFT—Report to Barron Field, Fort Worth, Texas.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to chief of war plans division of General Staff for duty with inventions section.

Note 3—Proceed to Dayton, Ohio; Elgin, Ill.; Buffalo, N. Y. and Camp Greene, Charlotte, N. C.

Note 4—Report to aviation general supply depot, San Antonio, Texas.

Note 5—Proceed to Camp Greene, N. C., for temporary duty.

Note 6—Report to Camp Jackson, Columbia, S. C.

Note 7—Report to chief of army baloon inspection, Akron, Ohio.

Note 8—Report to U. S. General Hospital, Fort Bayard, N. Mex., for treatment.

Note 9—Report to Capt. Edwin B. Lausier, finance dep't Signal Corps, 480 Lexington Ave., New York City.

Note 10—Report to general supply depot, Fort Mason, Cal.

Special Orders No. 115 to 120, Inc.

A

Anderson, Wallace A.	ASM
Allen, William R.	Note 2
Armstrong, Ralph Sheldon	SLR; LDT
Alexander, William Homer	SLR; KST
Anderson, Edward	SLR; KST
Atlas, Charles Elihu	SLR; KST
Archibald, James Alber	SLR; PMT
Ankemy, John Calvin	SLR; EOT
Anspach, Paul Parker	SLR; EOT
Andrews, Paul S.	FRF; RTR
Allen, George E.	DIK
Alton, Darrell D.	DIK
Angier, Corlies	SLR; GLC
Adams, James Ellsworth	SLR; RSD
Aleshouck, Joseph William	SLR; GLC
Arnold, Ivan T.	BST
Auchard, Oliver C.	FRF
Ackerman, Edgar M.	UTA
Anderson, Fred C.	RTR
Armitage, George T.	RTR
Arnold Henry R.	DIK
Abbott, Edwin Irving	SLR; DIK
Addington, Edward P.	DIK
Ames, Stanley Mitchell	SLR
Avera, John William	SLR; DIK
Ainsworth, Cyril	SLR
Austin, Galvin Eustace	SLR; BFT
Adams, James E.	FRF
Allen Albert Alonzo	SLR; LDT
Allan Roy Folger	SLR; EOT
Adams, Quinlan	KST

B

Bailey, Dan Wood	SLR; CRI
Brown, Orlo William	FLR; VBW
Burnet, Gilbert William	SLR; KST
Buell, Harry C.	Note 10
Bliss, Abel Brockway	SLR; VBW
Billings, Roy Hea on	SLR; VBW
Bowen, Clark B.	SLR; RSD
Baxter, Donald Kimberly	SLR; DIK
Brackett, Elmer E.	DIK
Besse, Gerard C.	FRF
Bailey, Raymond L.	BST
Baum, Leland M.	BST
Boardman, Vinson R.	BST
Bacon, Benjamin S.	FRF
Black, Asa R.	FRF
Burnett, Hunter T.	FRF
Bates, John H.	DIK
Butner, John C.	FRF
Bales, Harry O.	SMM
Brennan, Charles J.	SRC
Brown, Glenn W.	SRC
Baisley, Herbert Kenneth	SLR; RSD
Baxter, Alfred Whitcomb	SLR; KST
Beindorff, Robert Wilmer	SLR; KST
Beno, Charles Bernard	SLR; KST
Bixenstein, William Frederick	SLR; KST
Broms, Clarence Selby	SLR; KST
Benjamin, Everett Farrington	SLR; LDT
Batten, Eugene Cooper	SLR; HHN
Blackburn, James Mortimer	SLR; RWT
Bradley, Leslie Kenneth	SLR; RWT
Barnett, Robert M.	FRF
Bunkley, William H.	FLR
Belt, Dean Bryan	SLR; EOT
Bennett, John Crogan	SLR; EOT
Baker, Gordon	PFO
Baker, Joseph Brimmer	SLR; EOT
Brumbach, Jefferson Upton	FRF
Bradford, William Russell	FRF

Bash, Philip Purciance	FRF
Barden, Paul Ellsworth	FRF
Buchanan, James P.	DIK
Batt, Joseph S.	Note 7
Bailey, Dan W.	FRF
Barrett, Vinton E.	FRF
Brokaw, John A.	FRF
Bissel, Paul L., Jr.	FRF
Barker, Fred V.	FRF
Blake, John R.	FRF
Balahach, Nyle J.	BST
Bailey, Louis H.	MIT
Bryan, Edward G.	DIK
Baird, Chester A.	FRF
Blount, Frederick R., Jr.	DIK
Brown, Robert A. M.	KST
Brundidge, Moses M.	KST
Brantz, Harry E.	DIK
Babcock, Harry A.	DIK
Barnes, Dwight F.	DIK

C

Cawcutt, Ernest A.	REV
Canfield, John Peters	SLR; HHN
Crowdus, Walter Cary	SLR; LDT
Coleman, Arthur Augustus	SLR; EOT
Castor, Bernard Tobias	SLR; EOT
Comstock, Asa Hurley	SLR; KST
Carter, Harry William	SLR; RSD
Crum, Harry C.	FLR
Campbell, Hayden Snelson	SLR; LDT
Conant, Rellis Gilbert	SLR; EOT
Crawford, Frank Howard	SLR; KST
Craig, Iltred William	SLR; KST
Carlile, Robert, Jr.	SLR; KST
Cort, Arthur J.	DIK
Campbell, Robert A.	FRF
Conroy, Thomas Payne	SLR; LDT
Clarke, Chester Raymond	SLR; EOT
Crede, Lloyd Stanley	SLR; EOT
Curtin, James Golden	SLR; EOT
Carpenter, Earle J.	SLR; PMT
Coates, William Thomas	SLR; RSD
Coulter, William Eliot	SLR; KST
Cowdin, John C.	FLT
Cake, Joseph P.	RTR
Curley, Harry C.	RTR
Czuleger, Charles	RTR
Clark, Franklin W.	BST
Conway, John A.	UTA
Cronau, Robert T.	FRF
Chapin, Harry T.	SLR
Clark, Walter D., Jr.	BST
Christian, John G.	FRF
Cottrell, George W.	FRF
Clement, Otis G.	KST
Crary, Allan H.	AGC
Clark, Ralph S.	TFT
Clark, Roger P.	TFT
Coleman, Wiley L.	TFT
Cole, Robert L.	FLR
Crawford, James W.	RTR
Courtney, Albert A.	RTR
Chapman, Leonard B.	AGC
Cooke, Walter Ross, Jr.	FRF
Campion, John L.	TFT
Centner, William F.	TFT
Colvin, Arthur D.	DIK
Channing, John	SMM
Crowdus, Walter C.	DIK
Carter, Edward V.	DIK
Corbitt, Marsh M.	DIK
Covington, Euclide M.	DIK
Carter, Clarence L.	CIT
Conway, John Arthur	FRF
Campbell, Alexander	FRF
Chance, Percival Henry	SLR; BST
Caldwell, Victor B., Jr.	Note 7
Chauncey, Charles C.	FRF
Chaddock, Homer L.	DIK

D

Dewey, Robert A.	DIK
Daniels, William C.	DIK
Dana, Deane	SLR; EOT
Dawson, Charles Bertram	SLR; LDT
Du Pree, William Edmond	SLR; EOT
De Vore, Kenneth Lee	SLR; KST
D'Hodge, Wiley F.	BST
Dahringer, Homer W.	FLR
Dobbs, Silas A.	FRF
Durand, Elliott, Jr.	FLR
Dame, Ralph L.	KST
Dahl, Leighton	SGS
Duckett, Thomas P.	FRF
Dine, Herman Joseph	SLR; KST
Duncan, Lee John	SLR; GLC
Daniels, Albert James	SLR; EOT
Dowd, Harold Wallace	SLR; KST
Davis, Rowland L.	FRF
Dawson, John F.	RTR
Decker, Kenneth N.	BST
Denbe, George W.	BST
Duffy, James W., Jr.	TFT
Drinkwater, Arthur	FRF; RTR
DeLong, George I.	RTR
Dickman, W. L.	RTR
Dolan, John A.	RTR
Dyer, Clarence A.	DIK
Dunlap, Edwin W.	Note 10
Diavila, Louis Bernard	SLR; HHN
Dodge, Cecil Pillsbury	SLR; GLC
Dixon, Edwin M.	FRF
Dixon, Rollin L.	FRF
Dissette, John W.	SAG
Dana, Dean	DIK
DesChampe, James W.	DIK
D'Autremont, Hubrt H.	DIK
Dillaway, Mason M.	DIK
DeSmet, George W., Jr.	SLR; GLC

E

Erickson, Henning Lawrence	SLR; KST
Eimiller, Bert F.	RTR
Ellison, Charles E.	RTR
Ennis, George S.	RTR
Edmund, Harvey William	SLR; RSD
Eddy, Arthur E.	FRF
Edson, Albert L.	DIK
Elliott, Douglas S.	TFT
Eckstrom, Lawrence Joel	SLR; HHN
Ewing, Hugh Whitton	SLR; RSD
Ellioot, Clinton, Jr.	SLR; GLC
Ebright, Carroll M.	BST
Ellison, Howard	KST

F

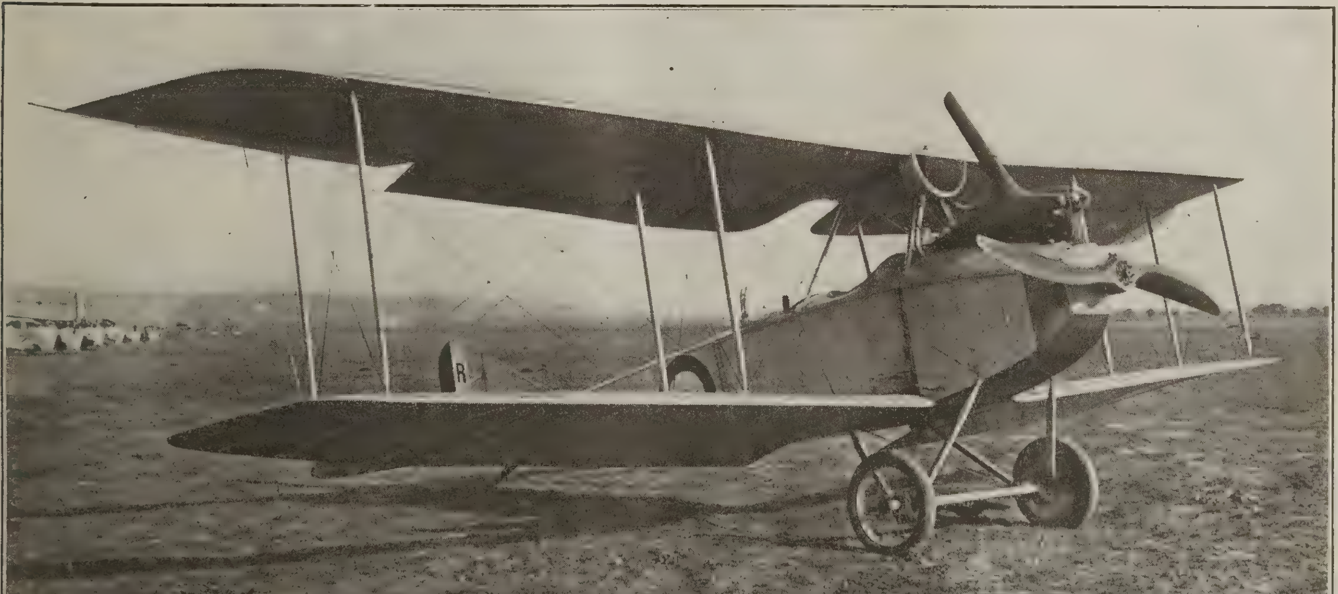
Fleming, Victor L.	SLR; CSO
Fraser, Dean Blenus	SLR; PMT
Forbes, Oliver D.	BST
Foster, Ralph F.	BST
Fisher, George V.	RTR
Frantz, Casper	RTR
Fearn, Edmund, Jr.	SLR; PUP
Fitzpatrick, William H., Jr.	FLT; LHV
Freeman, Edward Woolsey	FLR; VBW
Flesh, Alfred Louis	SLR; SAG
Farrell, Gerald J.	RTR
Finney, William S	RTR
Firestone, Allen	RTR
Foster, Lee Wood	SLR; RWT
Feltus, Russell Hodge	SLR; EOT
Ferris, James Joseph	SLR; EOT
Fitzgerald, John J.	KST
Faircloth, Edward C.	TFT
Foster, Henry B.	TFT
Farmer, Marion A.	FLR
Fuller, Wiley M.	FRF
Foreman, James A.	KST
Fox, Benedict	KST
Field, William P.	CSO
Fairfield, Edward M.	DIK
Flynn, Mortimer G.	DIK

G

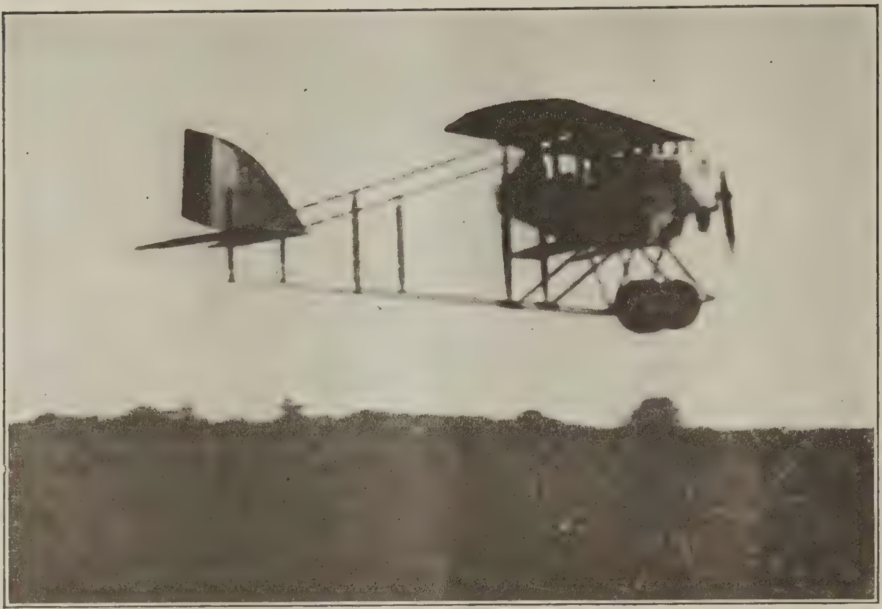
Grasse, Carl A.	FRF
Glenn, Edgar Eugene	SLR; RWT
Gill, Hamilton Arlington	SLR; LDT
Goss, Lewis William	SLR; RSD
Gagnon, Alfred	RTR
Grayson, Walter A.	RTR
Gould, DeAlton F.	RTR
Grady, William G.	RTR
Green, Guy W.	TFT
Gendron, Leon P.	DIK
Goddard, Fred C.	DIK
Gathings, James Clinton, Jr.	SLR; EOT
Grisemer, Walter	SLR; EOT
Gude, Adolph E.	BST
Guthrie, Clifford B.	BST
Garties, George	FRF
Griffith, Clyde I.	FRF
Gouy, Arthur C.	AGC
Graves, Nelson M.	FRF
Graham, William R.	AGC
Gilbert, John W.	TFT
Giles, Benjamin F.	FLR
Gill, Thomas H.	FRF
Grimes, William B.	RTR
Gaines, Edmond P.	TFT
Gilman, Harold A.	DIK
Goodstein, David Moss	SLR; DIK
Glanz, Carl C.	FRF; DIK
Gilbert, Lester F.	CSO
Gleerup, William W.	DIK
Gowans, John	DIK
Galligan, Patrick R.	KST
Garrity, George F.	KST
Gilder, Rodman	MJR
Guthier, Roy Edwin	SLR; DIK
Goode, Henry W.	DIK
Golden, William W.	KST
Gordon, Harry R.	KST
Greenwood, Levi C.	KST
Guard, James W.	FRF
Griffith, Frank L.	FRF
Geisler, Clement George	SLR

H

Honn, Laurence Claude	SLR; RSD
Harris, Carl Alvin	SLR; CWT
Halpin, John H.	DIK
Hastings, Morris Ogden	SLR; RSD
Hudson, James L.	WAC
Hall, Dudley, Jr.	WAC
Hines, Harvey F.	RTR
Hallett, George E. A.	MAJ; CSO
Hay, Wellington Burt	SLR; KST
Hassler, Paul C.	RTR
Hellman, Frank J.	RTR
Hibbard, John J.	RTR
Hoff, Fred D.	RTR
Holton, Russell G.	RTR



A Rumpler type of German machine captured by the French. (French Official Photo)



A training Caudron biplane. Note the trailing landing skid, which adds to the safety in landing for the beginner. (French Official Photo)

Hunt, Frank L.	RTR
Hunt, Roy E.	UTA
Hill, Glenn R.	TFT
Hall, Levi M.	TFT
Hoffman, Joseph K., Jr.	TFT
Hind, Harry L.	AGC
Hill, Maurice S.	SMM
Hotaling, Harry Dawson	SLR; EOT
Hann, Ralston P.	SLR; LDT
Hobbs, Edward H.	FLR
Hanson, Howell R.	FRF
Harding, Roy E.	DIK
Helgesson, Henry T.	DIK
Hodge, Glenn B.	DIK
Hornig, William F.	BST
Holland, Maurice	MIT
Hartman, Harry B.	HHN
Helweg, Lawrence W.	DIK
Hinman, David E. B.	DIK
Hassett, Emmitt A.	TFT
Harrison, Travis L.	TFT
Harrison, Mathew	Note 8
Harrison, Elbert Iredall	SLR; DIK
Hyde, Gordon E.	FRF
Houlihan, Daniel James	SLR; AAD
Hazelton, Oscar M.	KST
Hulbert, Ray C.	KST
Hunton, Lewis G.	KST
Heine, Bernhardt E.	DIK
Harrigan, Comeline H.	DIK
Harrington, Henry Gilbert	SLR; DIK
Hicks, John	SLR
Hart, John Francis	SLR
Hittig, William, Jr.	SLR
Horne, Ernest Grover	SLR; DIK
Hanely, Harold Robinson	SLR
Hodge, Clarence Esterly	SLR
Holmes, George Gilbreth	SLR; DIK
Hamby, William Fred	SLR; VBW
Hunt, Roy E.	FRF
Hilton, William T.	FRF
Harmon, Ernest E.	FR
Holladay, Daniel M.	FRF
Hurd, Mark M.	DIK
Hansen, George W.	SRC
Ham, Mark N.	DIK
Hall, James H.	KST
Harvey, Otis L.	KST
Hawn, Albert R.	KST
Herndon, James P.	KST
Harvey, Harold M.	DIK
Hirshfield, Ira W.	DIK
Howe, Lawrence L.	DIK
Hartman, Frederick S.	DIK
Huffman, Carl F.	DIK
Hollingsworth, John Y.	DIK

I

Inglesby, Joseph E., Jr.	TFT
Isbill, Paul Martin	SLR
Ingraham, Forrest W.	DIK

J

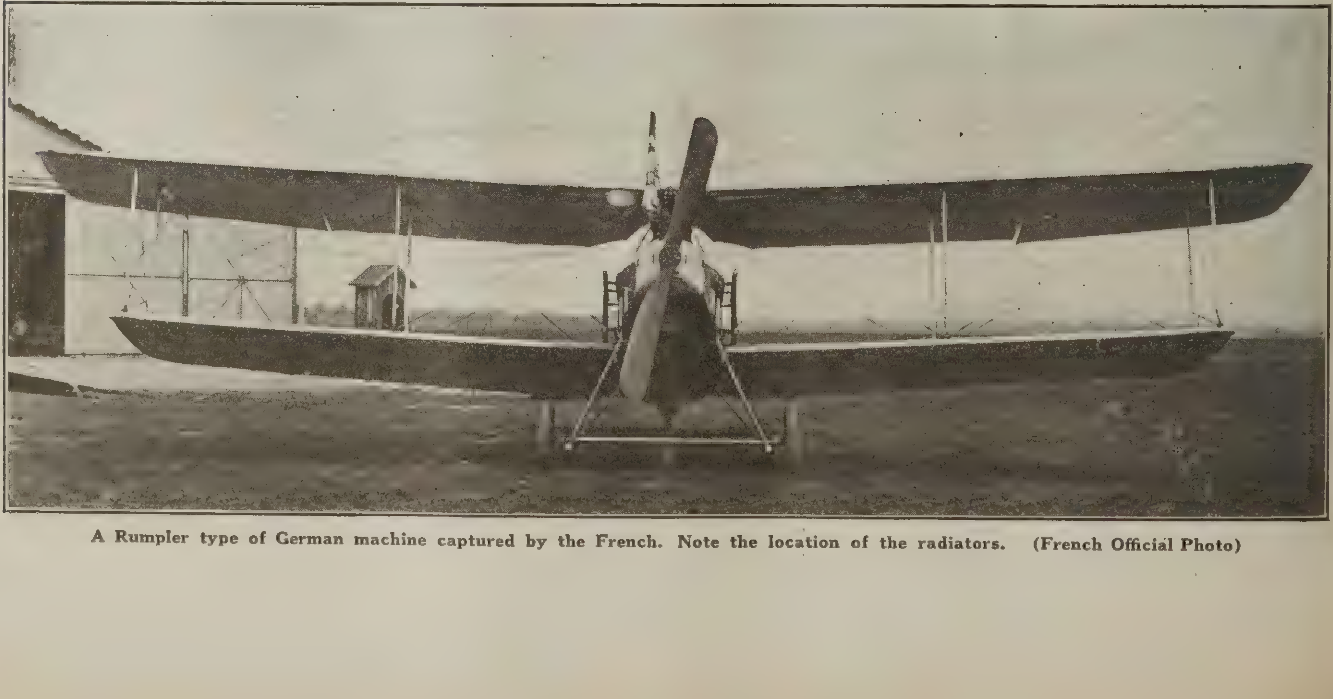
Johnson, John M.	SAG
James, Van Allen	TFT
Jensen, Chris H.	RTR
Judson, Henry H.	RTR
Johnstone, Hugh R.	DIK
Joseph, Jesse S.	CIT
Johnston, Stephen B., Jr.	KST
Jones, Buford H.	KST
Johansen, John M.	FRF
Jordan, James J.	DIK
Jones, Howard T.	DIK
Jessop, Richard	SLR; KST
Jamison, Ross P.	DIK
Lea, Royal B.	DIK
Jacobs, George S.	DIK
Jarvis, Samuel G.	FRF
Jones, William M.	UCB

K

Kritzen, Henry Ellis	SLR; EOT
Kimball, Francis Nelson	SLR; LDT
Kultgen, John Henry	SLR; HHN
Kelley, James M., Jr.	SMM
King, Harry Calvin	SLR
Kinney, Wallace Elliott	SLR
Kidder, Henry P.	FRF
Kern, Edward E.	FRF
Kelly, Philip J.	FRF
Keeling, Walter S.	DIK
Kendrick, Aaron T.	FRF
Kendall, Ralph N.	KST
Krick, Frank	SLR; VBW
Kilcup, Norman L.	KST
Korman, Egbert J.	KST
Keith, Alexander H.	FLT
Kaplowitt, Mack B.	FRF
Kilroe, John C.	DIK
Kelcey, George G.	DIK
Kultgen, John H.	DIK
Kimball, Milton S.	FRF
Kauffman, Cyrus S.	FRF
Kerwin, William James, Jr.	SLR; KST
Kirby, Harley Elmer	SLR; KST
King, Charles D.	FRF
Kronig, Louis H., Jr.	KST
King, Ned E.	FRF
Keough, Wesley L.	SAG
Kicklighter, Charles H.	MIT
Kline, John R.	DIK
Kelly, James M.	RTR
Keeffe, Louis R.	FRF
Kear, Charles E.	TFT
Kober, Edgar I.	TFT
Koiner, Carl W.	BST
Knapp, Ralph A.	BST
Kelley, Harold C.	DIK
Keith, Jerome	SLR; BFT
Kane, John F.	RTR
Kiess, Clarence W.	RTR

L

Link, Rue Showalter	SLR; CRI: FRF
Luttrell, Nathaniel H.	Note 2
Larkin, George C.	RTR
Lindsay, Oliver Christian	SLR
Livesay, George Byron	SLR; DIK
Lienhard, John Henry	SLR
La Prade, Ernest Maitland	SLR; RWT
Lawrence, Henry Donald	SLR; EOT
Levinson, Jesse A.	REV; VBW
Longley, Francis B.	MAC
Larer, George Norwood	SLR; KST
Lansing, William E.	RTR
Larkin, Edward J.	BST
Lucas, Ottis P.	FRF
Lake, Chester H.	PUP
Lewis, David E.	BST
Locher, Bailey J.	RTR
Lobdell, Warren L.	BST
Lowry, William J.	BST
Lesley, Hubert	DIK
Leech, William I.	RTR
LeGrand, Lewis W.	RTR
Lynch, Thomas	RTR
Lockwood, Milton K.	FLR
Lane, Ray	Note 7
Lane, Herbert V.	DIK
Lawrence, Dudley B.	CSO
Liensech, Charles F.	DIK
Landram, Harry T.	KST
Lankey, Francis I.	DIK
Lyle, Fred B.	TFT
Lewis, Orman J.	DIK



A Rumpler type of German machine captured by the French. Note the location of the radiators. (French Official Photo)

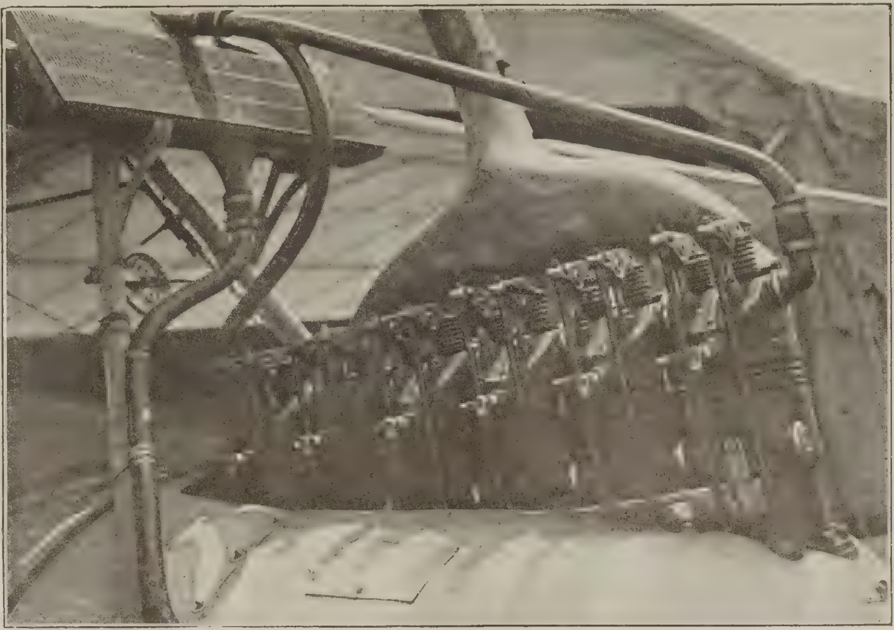
Lane, Orlando H.	DIK
Lord, Merritt M.	FRF
Ledbetter, Eugene P.	SMM
Lick, Walter E.	DIK

M

Merritt, Edward Kellogg	SLR; RSD
Montague, Harley Howard	SLR; LDT
Mackenzie, William James	SLR; CWT
Mills, Harold W.	FRF
Meyers, Marion T.	DIK
Mayer, Arthur C.	DIK
Milburn, George J.	SLR; FRF; DIK
Marvin, Arthur B.	CDT; SAG; Note 1
Mansell, Isaac Errett	SLR; LDT
Merkel, Louis Johnson	SLR; LDT; FRF
Mayhew, Harry E.	KST
Murphy, Harry Clifford	SLR; KST
Morgan, Herbert Peyton	SLR; BFT
Meers, Herbert Herman	SLR; LDT
Maloney, Herbert L.	CUI
Majors, Earl	RTR
Meredith, George W.	SMM
Madsen, Olav	RTR
Mills, Omer	RTR
Mitchell, Maurice P.	RTR
Moore, Bernard S.	RTR
Morthland, Merle Al.	SLR; KST
Miller, Frank Milford	SLR; AAD
Mosher, Roy Bradford	SLR; GLC
Madison, Clinton Rice	SLR; KST
Mann, William DeFees	SLR; KST
Mead, Michael Francis	SLR; KST
Miller, James Andrew	SLR; KST
Moore, Clydus Lloyd	SLR; KST
Mildeberger, Ethan A.	KST
Millington, Harry	KST
Mousley, John L.	KST
Mook, Harold F.	BST
Moore, Marlin C.	BST
Murray, H. Sinclair	BST
Mackie, Pearle	FRF
Merrill, Charles E.	FRF
Meeks, Charles C.	TFT
Maynard, Kenyon C.	DIK
Morris, Julian B.	DIK
Monahan, John W.	FRF
Morrill, Richard C.	FRF
Markley, John Wayne	SLR; KST
Merrick, Bentley A.	FRF
Miller, Edward A.	DIK
Moore, David H.	DIK
Moore, Harold A.	DIK
Marshall, Robert J.	Note 7
Munoz, Francis M.	FRF
Martin, James Carey	SLR; EOT
Megahan, Donald Bruce	SLR; EOT
Melican, George Deady	SLR; EOT
Meadows, Asbury W.	TFT
Metzger, Carlysle L.	DIK
Murphy, Harry C.	DIK
Mooers, Edward A.	BST
Marsh, Gerald Gilbert	SLR; DIK
Mosher, Roy B.	FRF
Mollison, James Alexander	SLR
Moore, John Sutherland	SLR
Moss, Douglas Rogers	SLR
Meyer, Emil Albert	SLR; DIK
Mathews, James Christopher	SLR
Machle, Jerome Benjamin	SLR
Madden, John Henry	SLR; DIK

Mc

McCoy, Dell H.	FRF
McKay, Woodrow	FRF
MacKenzie, William J.	DIK
McCaffrey, James Augustine	SLR
McDonald, George Clement	SLR; DIK
McKenney, Samuel Mortimer	SLR; DIK
McVickar, John Bard	SLR; DIK
McKay, Edgar John Waring	SLR
MacCracken, William Patterson	SLR; RWT
McEnerny, Daniel Thomas	SLR; EOT
McCabe, Roscoe E.	DIK
McCabe, Ross	FRF
McFarland, Denman T.	FLR
McCabe, Frank M.	CPR
McKee, William B.	RTR
McLaughlin, Charles P.	RTR
McDonell, Edwin A.	SAG
McDowell, Herbert Levent	SLR; KST
McDuffie, Arthur Lattner	SLR; LDT
McAuliffe, William F.	DIK
McDonough, Hubert B.	DIK
McLaren, William B.	FRF
McCarron, Henry Albert	SLR; AAD
McWilliams, James L.	SMM
McKernon, George E.	FRF
McCormick, Ralph C.	DIK
McIntosh, Lawrence W.	FRF
McRea, Harry B.	DIK
McFalls, Edwin L.	FRF
MacEnroe, John W.	TFT
MacDougall, Kirkland B.	WAC
McCartney, Charles Edwin	SLR; LDT
McIllhiney, Donald W.	CIT



The engine mounting of the Benz in a late type of German aeroplane

N

Nietz, Adolph Hugo	SLR; LHV
Noren, Carl Albin	SLR; CRI; FRF
Nelson, Arlen Claron	SLR; RSD
Noble, Arthur Warren	SLR; KST
Naugle, Frank Sherburne	SLR; DIK
Neely, Harold R.	CRI
Nesbitt, Arthur E.	RTR
Northup, Benjamin L.	RTR
Nelson, Luther	DIK
Nethercut, William R.	FRF
Neal, Guy O.	KST
Nigh, Gordon K.	BST
Noonan, George Carroll	SLR; DIK
Neubauer, George R.	DIK
Nye, John A.	RTR
Nichols, George William	SLR; DIK

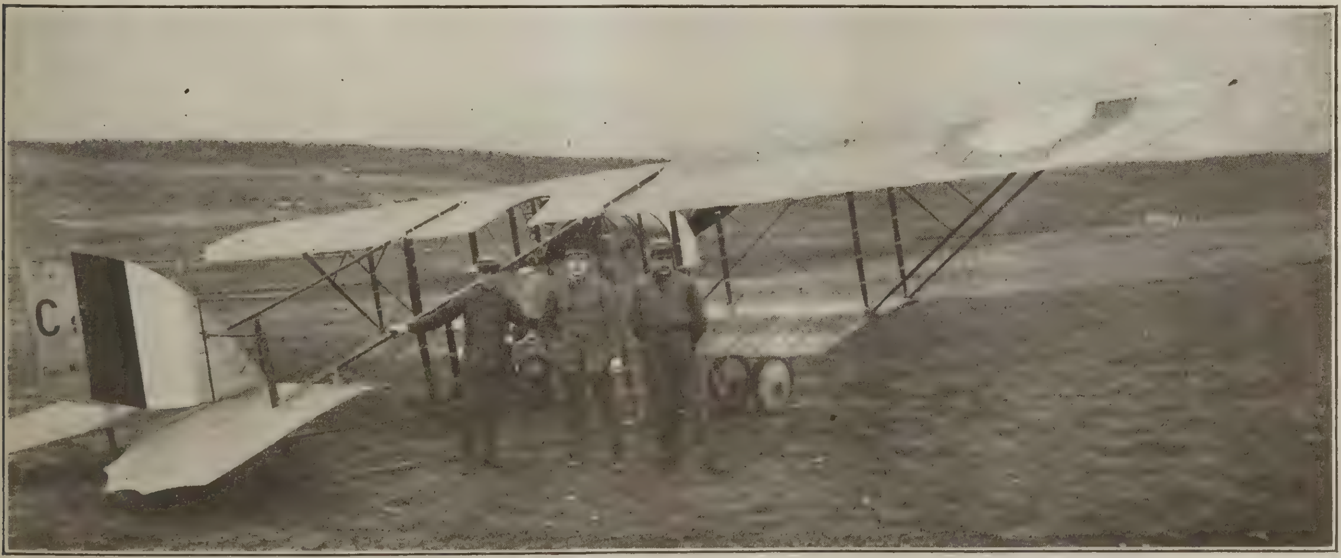
O

O'German, William S.	UTA
O'Hare, Thomas K.	DIK
O'Connor, Thomas Francis	SLR; DIK
O'Brien, James Sherry	SLR; GLC; FRF
O'Brien, William E.	RTR
O'Brien, Raymond K.	FRF
O'Neill, Harry L.	RTR
O'Dowda, John S.	FRF
Odale, Walter B.	RTR
Oviatt, Howard M.	RTR
Otis, Thomas F.	BST
Ormond, Roy B.	DIK
Oliphant, Rufus A.	DIK
Olssen, William E., Jr.	DIK
Olmstead, Charles H.	KST
Orr, Dale	SLR
Oliver, Philip Estey	SLR

P

Poste, Ellsworth	SLR; KST
Pratt, Harold Clifton	SLR; KST
Peck, Lee Hubert	SLR; GLC; FRF
Park, John Watson	SLR; GLC; FRF
Parker, Herbert Wallace	SLR; EOT
Page, John Harry	SLR; EOT
Prindle, William D.	DIK
Patton, Hilton M.	FRF
Provoost, John Croes	SLR; GLC; FRF

(Continued on page 647)



A French training Caudron biplane. The landing chassis and skid are noteworthy. (French Official Photo)

FOREIGN NEWS

BELGIUM

"Our aviation has new successes to its credit, apart from its regular duties of observing and photographing. Adjutant Domeulemester has brought down his tenth plane, Lieutenant Oliestagers his sixth, and Adjutant Coppens has destroyed his fourth German balloon," says the Belgian official announcement, made public at Washington on May 27th.

FRANCE

The official night statement given out by the French War Office on May 30th, reports great aerial activity. The text of the statement follows:

"The enemy air forces, which have been very aggressive and numerous during the battle, have been attacked with the greatest daring by French airmen, who destroyed nineteen German machines, brought down two balloons and compelled twenty-three enemy aeroplanes to land in a damaged condition.

"On the night of May 27-28 French aviators dropped twenty-three tons of explosives on bridges and crossing on the Ailette and Aisne and on various cantonments. The next night and day thirty-seven tons of bombs were dropped on convoys, troops and railway stations."

Extensive aerial operations are reported in the French official announcement of June 1st, the text of which follows:

"On May 31st aerial fighting continued along the battlefront.

"Our airmen attacked with their usual dash enemy aeroplanes, twenty-three of which were brought down and fourteen gravely damaged. Enemy captive balloons were harassed without respite, being forced frequently to make a landing. Their observation work has been considerably interfered with, and six of them were destroyed.

"Our observers have never ceased to mark out the enemy lines and send information to the commanders concerning enemy movements. They have carried out reconnaissances day and night as far as Varvins, Guise, Le Cateau, and Hirson.

"Finally, in the entire battle zone our escadrilles have employed their machine guns against German troops on the march, inflicting serious losses."

Captain De Ullin, it was announced, has won his twentieth aerial victory. The captain was a partner of the late Captain Guynemer, the French ace.

GERMANY

The German official statement issued on May 29th reports the following aerial operations:

"In spite of the changing weather, our aerial forces are attacking the enemy again and again with bombs and machine guns, while aviators have surveyed without interruption our progressing attacks and effect of our artillery fire."

Summarizing aerial activity during the first three days of the second phase of the German offensive, the official statement of May 30th reports the following:

"During the last three days our aviators have brought down thirty-eight enemy aeroplanes south of Ypres. Five enemy captive balloons were brought down in flames."

The German official statement for June 1st states that "in the last two days we have shot down thirty-six enemy aeroplanes."

GREAT BRITAIN

The official statement on aerial operations made public on May 27th says:

"Owing to low clouds and dense mist little flying was possible on Sunday until evening. Four tons of bombs were dropped on targets in the neighborhood of Armentieres and Fricourt. Six hostile machines were brought down in air fighting. None of ours is missing.

"On Monday the Bendorf railway station, in Rhenish Prussia, was bombarded. Twenty heavy projectiles were dropped and explosions were seen on the railway sidings. Our bombing machines were heavily attacked by hostile scouts. One of our machines was seen to go down under control. All the other aeroplanes returned safely."

British aerial operations are described in an official communication on May 29th as follows:

"Our aeroplanes dropped twenty-five tons of bombs during the day on hostile billets, dumps, and railways behind the enemy's lines on all parts of the British front.

"Thirteen German machines were destroyed in air fighting, and four others were brought down out of control. Five of ours are missing.

"Bombing was continued on the night of Tuesday. Five tons of bombs were dropped on various targets, including billets at Armentieres and the Valenciennes Railway Station. One of our night bombing machines failed to return.

"On Wednesday a number of long-distance day bombing machines attacked Thionville. They dropped a ton of bombs with good effect on the station and sidings. At the same time other machines bombed the railway and barracks at Metz-Sablons. In spite of hostile attacks from the air and ground all the machines returned."

Successful aerial operations by the British Air Force are recorded in the official announcement of May 28th, the text of which follows:

"Monday the weather generally was cloudy and the visibility was not good. However, a full day's work was done by our aeroplanes, both in co-operation with the artillery and in photography and bombing.

"Sixteen tons of bombs were dropped in the course of the day on various objectives, including billets between Armentieres and Lens, and the docks at Bruges.

"Fifteen German machines were destroyed and three driven down out of control.

"Two of our machines are missing.

"Monday night heavy bombs were dropped on the Zeebrugge lock and the Bruges docks. A great number of dumps and billets behind the enemy's lines also were bombed. A total weight of twenty-one tons of bombs was used in these different attacks. All the aeroplanes engaged in this work returned in safety.

"Hostile night-bombing machines have been active over our back areas. A Gotha aeroplane was forced to descend behind our lines, and its three occupants were captured.

"The same night our long-distance bombing machines were very active. They dropped between four and five tons of bombs on chemical works at Mannheim, the Landau railway station, an electric power station at Kreuzwald, and on the Metz-Sablons railway station and the Courcelles railway station. Very large explosions were caused. All our machines except one returned."

The text of the statement on aerial activity on May 30th reads:

"Low clouds and poor visibility prevented much work by our aeroplanes on Wednesday until late in the afternoon, when the weather cleared. Five German machines were brought down in air fighting and one was driven down out of control. We lost none.

"Five tons of bombs were dropped by our machines during the day on ammunition dumps and billets in the neighborhood of Armentieres and Bapaume.

"The bombing operations continued during Wednesday night, and sixteen tons of bombs were dropped on railway stations, including those at Valenciennes and Basigny, and on towns and roads behind the enemy's lines. Projectiles were also dropped on the docks at Bruges. All our machines returned."

The British official statement on aerial operations issued May 31st, reports the following activity:

"Our aeroplanes and balloons on Thursday were very active, the fine weather enabling much work to be done in co-operation with the artillery as well as in reconnaissance and photography.

"Bombing was carried out vigorously all day. Thirty-eight tons of bombs were dropped on various targets, including railways, roads, dumps and billets at Merville, Armentieres, Bapaume, Albert and Valenciennes.

"Twenty-eight German machines and two German balloons were destroyed during the day and six other hostile aeroplanes were driven down out of control."

A long, heavy aerial attack was made on Zeebrugge, Thursday night, (May 30th), and at about 1 o'clock in the morning. There was a tremendous crash, the concussion being felt by the entire neighborhood.

Flames rose high in the air, and it is supposed that a powder magazine was exploded, according to a Flushing dispatch to the "Telegraaf."

The War Office communication dealing with aviation for June 1st reports the following operations:

"Our aeroplanes and balloons on Thursday were very active, the fine weather enabling much work to be done in co-operation with the artillery, as well as in reconnaissance and photography.

"Bombing was carried out vigorously all day. Thirty-eight tons of bombs were dropped on various targets, including railways, roads, dumps and billets at Merville, Armentieres, Bapaume, Albert and Valenciennes.

"Twenty-eight German machines and two German balloons were destroyed during the day and six other hostile aeroplanes were driven down out of control."

The following communication dealing with aviation was issued June 2nd:

"There was fine weather Saturday. In air fighting twenty-one German machines were destroyed and four others disabled. Four enemy observation balloons were destroyed. Four of our machines are missing.

"We dropped twenty tons of bombs during the course of the day, successful attacks being made on the Zeebrugge Mole and the railways of Armentieres, Rozieres, Boesinghe, and Fleres. The railway at Karthaus and the Metz-Sablons Railway station also were heavily attacked by long distance machines, one of which failed to return."

An Admiralty announcement on aerial operations on May 27th, says:

"Bombing operations have been carried out against Mariakerke and Zeebrugge, where bombs were observed to fall close to the lock gates of the canal. Nearly three tons also were dropped on the Bruges docks Wednesday night. All our machines returned safely.

"In home waters numerous flights by the escort patrol and other anti-submarine duties were carried out. Submarines were sighted and attacked and enemy mines were located on several occasions.

"Our seaplanes also carried out long reconnaissances over the North Sea.

"On May 20th allied aircraft made a successful bombing attack on the Austrian naval base at Cattaro. A direct hit was obtained on barracks occupied by submarine crews and a fire was seen to break-out."

ITALY

The Italian official statement for May 27th states that eight hostile aeroplanes were brought down in aerial operations.

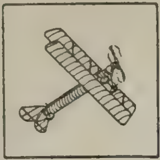
The official communication for May 31st says:

"The aerial activity has been intense. Enemy trenches, dumps, and hutments have been bombed on the Asiago and Lavarone Plateaus. The roads loading to Gaillio, and troops and transports were attacked with machine gun fire. Three hostile aircraft were downed."

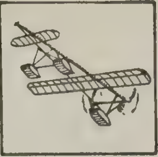
Reporting on aerial operations, the Italian War Office issued the following announcement on June 2nd:

"Italian and Allied air squadrons were very active. They dropped five tons of bombs on enemy aviation camps. Five hostile aeroplanes were brought down in air fighting, and our artillery destroyed another on the left bank of the Piave River."

Major Baracca, the leading Italian ace, has brought down his thirty-second adversary, according to a despatch from the Italian front to the Temps. He shot down the leading aeroplane of an enemy squadron.



MODEL NEWS



Edited by John F. McMahon

Model Aeroplane Building as a Step to Aeronautical Engineering

PROPELLER carving is that part of model building which the novice hates to think about. To him it is a Chinese puzzle, but there is no reason for this, because if the instructions are carefully carried out he will have little trouble in designing an efficient propeller.

We have just built a model having a 24-inch spread. We must now find the propeller for this model. Experiments show, for a single propeller flying model, the diameter should be one-third of the spread, in this case 8 inches. The pitch for a tractor must be medium, or 17 inches for this diameter.

To find the pitch of a propeller refer to Figure 8. Our propeller is 8 inches in diameter, then the tips in one revolution will travel 8 x 3.1416, or 25 inches approximately. Now the width of our blade being 1½ inches, we divide the circumference 25 inches by the width of the blades 1½ inches to find how many widths are contained in the circumference .25 inches divided by 1½ inches = 16 2/3 times, or to get even figures we will call it 17 times. Now the thickness of the blank we will use is 1 inch or for every blade width in the circumference the propeller screws its way 1 inch further into the air and by multiplying 1 inch x 17 blade widths we get 17 inches for the pitch.

The screw shown at Figure 5 will help the model builder to grasp what pitch means. We will say this screw is ⅛ inch pitch. This means, if we were to take a screw driver and give the screw one complete turn in the wood, it would advance ⅛ inch, so the propeller in one turn or revolution advances 17 inches. The model maker will remember this method of calculation is only approximate, but it is accurate enough for a model propeller. To figure the pitch of a propeller accurately it would necessitate a great deal of mathematical operations and we would have to calculate the pitch every half inch or so along the blade. The method, I have just outlined can be applied to any size of propeller by using the formula

$$\frac{\text{diam.} \times 3.1416}{\text{width of blade}} \times \text{Thickness of blank.}$$

Now that we know how to find the pitch, we will proceed to carve the propeller. We will select a block of white pine 10 inches long, 4 inches wide and 1 inch thick. This will give us ample space to work in. We next draw a line accurately in the centre of the block as a guide. Now draw lines on each side of this centre line 1½ inch from it. Then mark a point exactly half way from top and bottom of block or in this case 5 inches from the top. Now draw a line across the block at this point. Next lay off points on the two side lines 1½ inches from the cross line, now draw a line through the centre connecting the two points, we just laid out. Draw ovals around the centre point to mark out the hub, then make circles at the ends of blades to round off the tips, after which round off corners as shown.

Blank can be cut out by jig saw by following the outside lines or if you cannot procure a jig saw, carve out with a sharp pen knife.

To carve, hold blank firmly in left hand and shave off opposite blade with sharp pen knife, then give blade a sort of cupped shape. To finish use a rough sand paper. Polish off with fine sand paper. Now repeat the performance with the other blade. When this is done, turn blank over and carve the back of the blades. Be careful not to shave off too much, because there is danger of the blade of the knife cutting through the soft wood. When finished give it three coats of shellac varnish, allowing each coat to dry thoroughly before applying the other. When shellac is dry, drill a small hole in the hub, for the propeller shaft and put into place on the model.

Don't be discouraged if your first propeller doesn't come up to your expectations. It takes a little practise to do a good job. My first propeller was no credit to me, one blade had a greater pitch than the other, but it flew an Antoinette model 75 feet when the model record was 178 feet. So you see a model propeller will give some thrust even when made incorrectly, but of course the better workmanship always gives the best results.

The motive power to turn this size propeller consisst of 10 strands of ⅛ inch rubber.

Some experienced model builders prefer a propeller built up of two pieces of thin birch veneer, cut to shape and then bent over a flame, by twisting until the proper shape is accomplished. Lapped at the hubs and wrapped with thread and glue. See sketch.

"Slim" Ahrens Still Active

"Slim" Ahrens, who will be remembered as an old Illinois Model Club Flyer, is with the L. W. F. Co. at Central Park, L. I., flying field. He is about to build another light tractor and do some joy hopping in his spare time. "Slim" says he'll know how to fly by the time he finishes his next machine, even if he has to pay for it.

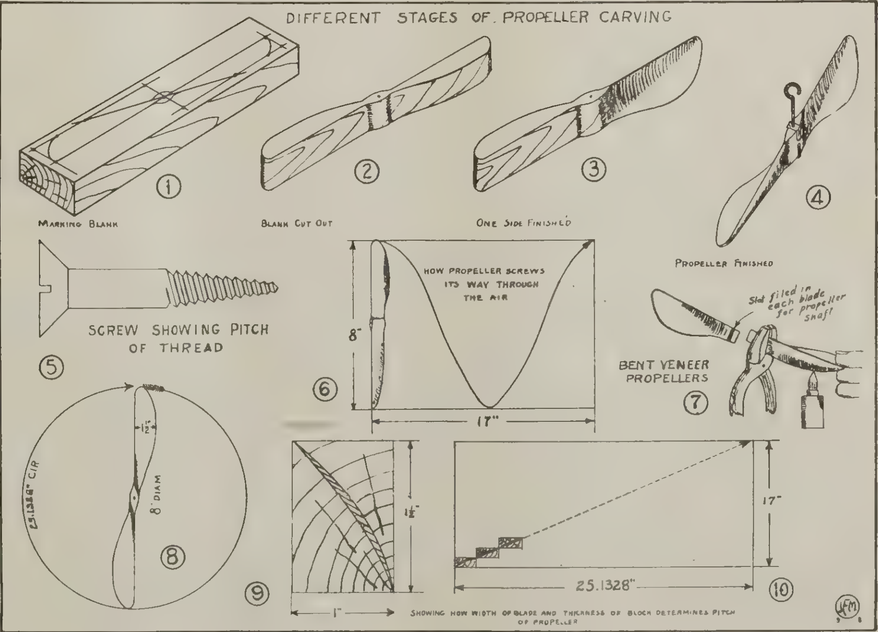
Every time "Slim" goes up he has a tendency to cut down telegraph poles and obstacles that get in his way.

"Slim" has a good knowledge of light H. P. machines and he has promised to publish some of his valuable "dope" on this page at an early date.

"Junior Aeronautical Reserve"

The Correspondence Model Aero Club, of Babylon, wishes all model flyers who would like to become "Junior Aeronautical Reserve" members to communicate with the Membership Secretary, Edwin A. Jenkins, No. 1141 Bushwick Avenue, Brooklyn, N. Y., who will be glad to give advice and help in this matter.

This club is the first to start this good work and every school boy and young man should get in line for the summer campaign.


DIFFERENT STAGES OF PROPELLER CARVING
①
MARKING BLANK
②
BLANK CUT OUT
③
ONE SIDE FINISHED
④
PROPELLER FINISHED
SCREW SHOWING PITCH OF THREAD
⑤
HOW PROPELLER SCREWS ITS WAY THROUGH THE AIR
8"
17"
⑥
Slot filed in each blade for propeller shaft
BENT VENEER PROPELLERS
⑦
1½"
8" DIAM
25.1328" CIR
⑧
⑨
1½"
1"
17"
25.1328"
⑩
SHOWING HOW WIDTH OF BLADE AND THICKNESS OF BLOCK DETERMINES PITCH OF PROPELLER
JFM

Method of finding the pitch of a propeller, also proper method for laying out propeller blank

INDUSTRIAL DEPARTMENT

NEW ORLEANS IN AVIATION

By **HOWARD EGLESTON**, Manager New Orleans Association of Commerce

NEW ORLEANS has made a start in the aeroplane industry and if the hopes and beliefs of those managing the Richardson Tandum Biplane are realized, as it appears probable they will be, it is sure to become one of the great centers of this industry. With great level plains surrounding the city on which alighting fields can be located, a lake twenty-five miles wide by forty miles long to fly over, equable climates, rare high winds. (In the last forty-three years New Orleans has had only three storms in which the wind reached a velocity of sixty miles or over. In the period 1879 to 1916, thirty-seven years, Pensacola has had thirty storms in which the wind reached a velocity of sixty miles, and during practically similar periods, Galveston has had sixteen and Jacksonville nine storms of these high velocity of winds.) It would seem, therefore that of all similar locations, New Orleans was the best place for practice or trial flights.

Of materials required, we are in the center of production of cypress and number among our mercantile establishments the largest importers of mahogany in the country.

New Orleans has a large number of skilled cabinet-makers who can be very useful in aeroplane factories, and foundries for iron, steel and brass castings and machine shops capable of handling any size of work.

The "Industrial Canal," which has just been financed, will furnish ideal sites for the manufacture of hydroplanes or land planes. Housing facilities are ample for the present and can be easily increased as demand requires, for there are large areas already provided with sewers, water, gas, electric light and transportation, where dwellings can and will be erected as soon as needed.

The Association of Commerce, through its Industrial Bureau, stands ready to render any assistance that may be desired by persons interested in our city.

AERIAL INDUSTRIAL POSSIBILITIES AT MADISON—THE INLAND WATERFRONT CITY

By **DON E. MOWRY**, General Secretary, Madison Association of Commerce

FOR hydroaeroplanes and flying boat manufacturing and development Madison—the inland waterfront city—Wisconsin, offers exceptional possibilities.

Literally speaking, there are acres of water available for trials and tests. Madison is situated on an isthmus, half a mile or more in width, between two of her four lakes from which she derives her city slogan—"The Four Lake City." The largest lake—Mendota—has a stretch of seven miles, with a circumference of twenty-five miles. The next largest lake—Monona—has a circumference of twelve miles and a running distance of over three miles.

Since the world war began, Madison has had exceptional industrial growth. In 1914 ten of her principal manufacturing establishments employed in the neighborhood of 900 men, while in 1917 these same industries employed 3,000 men; and they estimate that in 1918 they will employ 4,000 men. Within a radius of forty miles of Madison in all directions, there is a population of 265,000 people, while within what is known as the "Madison Trade Zone," comprising the counties of southern Wisconsin, the richest section of the State, there are 475,000 people. It is estimated that the present industrial population is approximately 5,250 people. Comparing these estimated figures with the industrial population of 1910, it is quite evident that Madison is growing industrially, because at that time there were about 3,000 people employed in labor.

Since the war began two Government ordnance plants have been located in this city, each of which has contracts calling for several million dollars' worth of finished products. One of these ordnance companies is working directly under the direction of the Army and the other under the direction of the Navy.

Madison may be said to rival, although to a lesser degree, Cincinnati as a machine tool center. The Gisholt lathe, as well as the Steinle turret or full swing lathe, is world-famous. The demand for aircraft lines has created a call for a class of equipment that exceeds to a marked and decidedly noticeable degree any similar demands which followed the booms resulting from bicycle and automobile development. The recent demands, caused

View of Forest Products Laboratory At Madison, Showing Storage Yards largely by the war, have, therefore, demanded machinery requirements for this type of manufacturing, which are not only enormous but exceedingly exacting.

The nature of aircraft needs demand three cardinal features in the power unit: (1) Great power within a small space; (2) Minimum weight and positive security of successful operation. This combination requires (given a good design) (3) Extremely accurate workmanship as well as the highest grade of materials. The workmanship requires a degree of skill never before attempted in the manufacture of gasoline motors for any class of service. Absolutely smooth surfaces and exact duplication of sizes are required in cylinder bores and all chambers and passages, in which combustion takes place or its action effects. In addition, extreme accuracy and interchangeability of all parts of a strictly mechanical nature is of prime importance in order that perfect balance of operation may be insured in duplicate members of the unit.

When these requirements have been assured, there is one other requisite, namely, rapid and quantity production. When one considers the number of Liberty aeroplanes being built and the fact that each one has an engine or motor made up of twelve or more cylinders, in addition to all other parts, the problem becomes the more intricate. The machining of these cylinders, which are made from steel forgings, is in itself an interesting and highly technical process. There is at once a call for exceptionally heavy, powerful, rugged machine tools, capable of producing the very finest class of work. There is likewise a call for a class of tooling equipment which taxes the ingenuity of the tool designer and the qualities of the tool maker.

The accompanying illustration shows a Madison-made product. The Steinle 24 inch Full Swing Side Carriage Turret Lathe is equipped with tools for boring, doming and recessing cylinders for aeroplane cylinders and for turning the crank case insert on these cylinders at the same time that the other operations are going on. A cylinder is shown mounted in the machine and two cylinder forgings are also shown on the floor in front of the machine. This machine will perform the operations indicated above on a cylinder forging in thirty minutes easily and in an exceptionally accurate manner. One machine will, therefore, turn out fourty-four cylinders in twenty-two hours, or enough for three and one-third twelve cylinder motors. It might be interesting to know that this company has furnished many large installations of this character. One of them numbers twenty machines which, on the basis just indicated, would turn out cylinders for approximately sixty-one twelve cylinder motors per twenty-two hour day.

While the machine shown in the illustration was not originally designed for this work and is used very extensively in general industrial service, railroad work, in turning out projectiles, gun carriage parts and other munitions' work, it gives evidence of the fact that Madison machine tool makers are in the front rank in tool development, are equipped to make new designs to fit the changing needs of the aeroplane industry, and concerns like the Steinle Turret Machine Company must be recognized as pioneers in furnishing the equipment for machining Liberty motor cylinders—demanding exacting requirements.

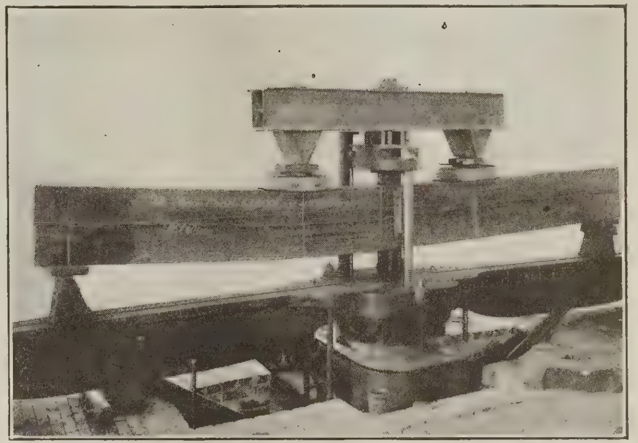
A newer and smaller concern, manufacturing the Olson Cylinder Grinding machines, the E. A. Fuller Sales Company, is not only making machines to grind automobile engines, but these machines are well suited for aviation motor work, and at the present time are being used by the French Government for that purpose. The Olson grinder is a simply constructed, easily operated machine. It is suitable for grinding cylinders from 2⅜ inch bore up to 6 inch bore.

Another important asset in the development of aeroplanes is the convenience of a laboratory. The C. F. Burgess Laboratories of Madison, Chemical Engineers, have and are conducting important investigations in the dry battery industry. It has always been contended by this company, which operates the Burgess Battery Co., that the field of dry battery uses was only touched upon the surface and that new uses would be found for them. This belief has been shown to be true, as dry batteries are being used more and more in new signal and lighting devices. The army field telephone sets, wireless sets, portable lights, etc., are equipped with dry cells of various types and the Burgess Battery Company has been co-operating with army engineers on new high capacity batteries.

There is likewise located in the city the French Battery and Carbon Company, manufacturers of commercial batteries. These two companies are probably the best equipped dry battery concerns in the country, and a mass of test data and information to help in the design of new types of battery is available. Any problems concerning battery ignition, radio signalling and aeroplane lighting and signals can be worked out here in Madison probably better than in any other place in the country, and the Burgess Battery Company, through the C. F. Burgess Latoratories, stands ready to offer its services.

Because Madison is an inland waterfront city, and has given no little attention to the subject of aquatics, there are likewise available skilled workmen, employed by the Madison Tent and Awning Company and the John Gallagher Company, who have knowledge of the materials which are used in the construction of aeroplane wings, etc. At the University of Wisconsin many experiments have been conducted with aeroplanes and hydroplanes.

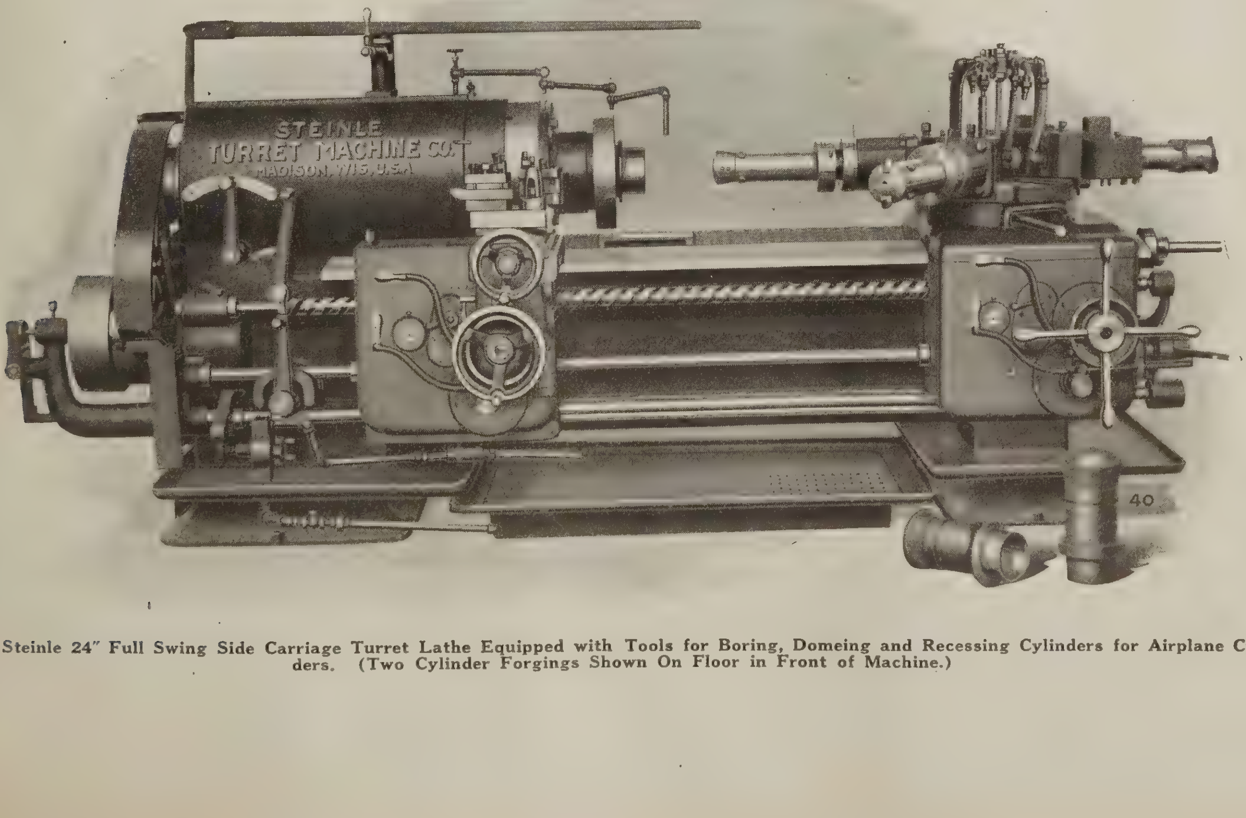
Like any branch of engineering, aeronautic engineering is based largely upon principles common to all branches—and yet—some phases of aeronautic engineering are peculiar to that branch. The Engineering College of the University of Wisconsin, located in Madison, is fully prepared to give training in the common basal subjects, and is developing the special subjects, so that even now students of engineering may specialize in aeronautic engineering.


Method Employed in Testing Large Timbers. Upwards of 200,000 Tests Have Been Made on American Woods in Madison

Among the laboratories of the College, whose equipment is especially adapted for work in the aeronautic field, are the mechanical laboratory and the materials testing laboratory. The first contains automobile and aviation engines of many kinds, all available for instruction and experimental purposes. The second contains a full complement of testing machines so that strength tests of any and all parts of aircraft can be made there. These facilities are an asset which should not be overlooked by those who are looking for aerial industrial possibilities in the middle west.

Instruction in aeronautics has been given during the past two years in the Engineering College. Professor E. R. Maurer planned the course

(*Continued on page* 646)



The Steinle 24" Full Swing Side Carriage Turret Lathe Equipped with Tools for Boring, Domeing and Recessing Cylinders for Airplane Cylinders. (Two Cylinder Forgings Shown On Floor in Front of Machine.)

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Ruthless Rhymes

Whilst chasing Huns upon his Camel,
The Sopwith kind, and not the mammal
Reggie over-did a bank.
His head quite spoilt the petrol tank.

Fritz, upon his Gotha Raider,
London for a bee-line made-a;
Empty now is Fritz's garage.
Have you seen our A. A. barrage?

It took young Clarence just a week
His aircraft park in France to seek,
For, fitting out his Martinsyde,
They did not put a chart inside.

Horace on a B.E. 2 c.
Eloped one night with cousin Lucy;
He did not wed that daring wench.
They landed in a German trench!

Searchlights

The searchlights sweep the sombre skies,—
Slow-wheeling,—focussed here and there,
To catch the lurking treacheries
Within their wide-flung whirling snare;
And when they find the hidden foe
The eager hunters lay him low.

God's mightier beams are searching out
The Soul of Life and lighting it,
That His fair hosts may put to rout
The foes that have been blighting it;
Sweep clean, O Lord, and beautify,
And come Thou in and occupy!

A Romance

"Litely she tript along the streat in the direction of home and bliss and brekfast, carrying an eg in won and and a slab of baykon in the uther, when the villan of this romans slipt out of a doorway and nearly tript her up.

"Rotter!" she cried.

"Will yew be mine?" he snarled.

"No! Go home!"

"To the casule ward? Bah! Will yew marry me?"

"Whot! A rotter like you! Puff!"

"Ah!" he sied, skweezing her and, "'Ow devign!"

Partly becose she loathed the man, and partly becose the and he skweezed contained the eg, and did it no good, the bewtyus made agane cald him a rotter.

"I feel as if I am tredding on air" he said.

"Villan!" she hist. "Yew are tredding on my fut!"

"Kiss me!"

"Go and eat coke!"

"Kiss me, womon, or yew die!"

"Then I suppose I must die wether or not," she sed, desparingly. "Here goes!"

She kist him; but—

Twoz the Kiss of Kontemt!

(Anuther fine romans next month!—Author.)

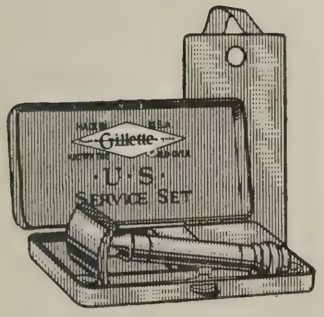
[Per-haps!—Editor.]

Scenes in an Aircraft Factory: In the accompanying cartoon in the immediate foreground a bomb-expert is deeply concerned regarding the intentions of a bomb carelessly left on the ground, and is apparently misled by the ticking of the watch of the active-service pilot behind him, whose combination of ultra-military uniform with Naval rank-stripes, stamps him as having been employed on land-going aeroplanes abroad. He, in turn, is interested in the efforts of two examiners to reconcile certain fittings with the drawings, the gentleman on the left being particularly puzzled as to how a fair-lead should pass through a bolt-hole.

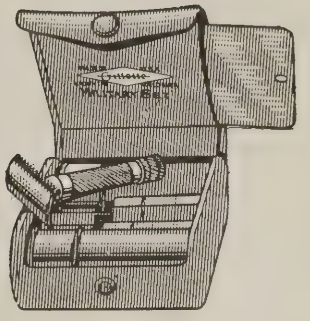
On the right, a warrant-officer inspector greets respectfully (as shown by his removing his pipe) a deep-sea pilot who has apparently just returned from Portsmouth with his pet spare part in a cage. Behind them, enshrined in glass, is the first fitting successfully got past inspection by the firm, and inscribed "3 Jan., 1915." Judging by the destruction of "dud" fittings in the background, it appears to have been about the last also, for the department's pet parrot has picked up the cry of "Scrap it!"

Level with the parrot, the "watch below" is taking a well-earned rest. Below him, a viewer with a correct nautical roll is taking more fittings for inspection. The proper nautical atmosphere is preserved by the glass-cased model of a ship on the left wall, and by the use of the Naval method of whispering orders, and of receiving them, as illustrated by the officer and man on the left. The telephonist in the extreme background also replies, "I—I—Sir," in Navy fashion. These customs prevent degeneration into mere lands-men by personnel employed on production work ashore.

Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set, No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

The men who shave near the big guns

Soon or late they all come to the Gillette—the razor that has proved itself in service everywhere, on land or sea. Whether it's in the billets back of the lines or on a ship under way—the Gillette is delivering the "once over" velvet smooth shave to millions of fighting men.

Have you seen the new Gillette sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette organization in the Service—men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—no Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in—that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle *a part turn*.

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles,
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·

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ASSIGNMENT
TO

Ground School?

If so our Educational Service Department can co-operate with you in helping you utilize your time to the best advantage by suggesting a course of aeronautic reading which will fit in with your

Ground School Studies

- **The Textbook of Military Aeronautics,** by Henry Woodhouse. **Price $6.25 postpaid.**
- **The Textbook of Naval Aeronautics,** by Henry Woodhouse. **Price $6.25 postpaid.**
- **The Aeroplane Speaks,** by Barber. **Price $3.25 postpaid.**
- **Learning to Fly in U. S. Army,** by Fales. **Price $1.60 postpaid.**
- **Aviation Engines,** by Page. **Price $3.25 postpaid.**
- **Dyke's Auto & Gas Engine Encyclopedia. Price $3.82 postpaid.**
- **Elements of Machine Design,** by Nachman. **Price $2.25 postpaid.**
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- **Glossary of Aviation Terms in French and English. Price $1.10 postpaid.**
- **The Eyes of the Army and Navy,** by Munday. **Price $2.15 postpaid.**
- **Gas Engine Principles,** by Whitman. **Price $1.70 postpaid.**
- **Aircraft and Submarines,** by Abbot. **Price $3.75 postpaid.**
- **Manual of Army Aeronautics. Price $.65 postpaid.**
- **Manual for Aero Companies,** by Satterfield. **Price $1.10 postpaid.**
- **Lewis Machine Gun. Price $.65 postpaid.**
- **Mechanical Engineer's Handbook,** by Marks. **Price $5.30. postpaid.**

The AERONAUTIC LIBRARY, Inc.
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New York City

(*Continued from page* 643)

especially for students of engineering, but, mainly on account of the war, interest in the subject has extended to non-technical students of the University of Wisconsin. At the present time about half of the membership of the class in aeronautics is non-technical. After the war it is safe to assume that a considerable portion of the general interest will subside and the subject will engage the attention of engineering students in the main. It is this class of students that the authorities are keeping in mind in the future extension and development of instruction in aeronautic engineering.

"Wood is to the aeroplane what bone is to the body," says C. P. Winslow, director of the Forest Products Laboratory. "Conditions arising out of this new use of wood have opened up a rather virgin field for technical investigation, and the importance of wood in our aircraft program has attached corresponding importance to wood technology in the field of science."

Wing beams and struts require a wood that is strong and stiff for its weight. Experiments and experiments show Sitka spruce to be best suited of all woods for the purpose. Ash is favored for longerons because of its bending properties and shock-resisting ability. Walnut and mahogany are used most extensively for propellers because of their stiffness and they retain their shape well.

Prior to our entrance into the war only air-seasoned lumber was accepted for aëroplane construction. It requires from one to three years, depending upon the size and species, to air-season this stock, and, obviously more rapid methods, that is, artificial seasoning was resorted to as soon as it could be shown that artificial seasoning was practicable. Kiln drying has made it possible to season stock in 15 to 40 days.

An aeroplane contains roughly 200 board feet of select lumber, but to get one thousand feet of such lumber requires the cutting of about 10,000 board feet. To build 25,000 aeroplanes would then require a lumber cut of some 250,000,000 feet. There is insufficient spruce available for such a large program and the tendency is to turn to the development of substitutes, and a similar course is being followed as regards the woods for other parts. This requires special knowledge of the physical and mechanical properties of each species, that is, comparative weights, tendency to shrink and warp, stiffness, resilience, etc., also the nature and effect of defects some of which can only be detected by an experienced eye.

Wood still holds first place in the construction of aeroplane propellers, and the propeller has the shortest life of any part of the machine. Many failures can be attributed directly to the effect of moisture. Moisture may get into the different laminations and cause unequal swelling with resulting internal stresses, or it may weaken the adhesive holding the laminations. It becomes very necessary to provide means of obviating such difficulties by the use of proper adhesives and by proper protections against moisture changes.

New tests must be devised for propeller woods to more nearly approximate actual conditions than would be the case with the usual methods of test. Greater care must be exercised in matching the several pieces entering into a single part, and this requires an exact knowledge of the relation between such factors as density and shrinkage.

There is a constant effort at improvement in aeroplane design. The aim is for the adjustment of each part to the exact service it performs, to secure strength with least weight and least resistance, or speed without sacrificing safety. Special members are being designed and different types of construction, all requiring scientific study of the raw material, wood, and methods of preparing it.

Madison can almost be called the world center of investigations in wood technology, by reason of the Forest Products Laboratory being located here. It is a Government institution maintained by the Forest Service, United States Department of Agriculture, in co-operation with the University of Wisconsin. Established in 1910 it was the first laboratory of its kind in the world and probably nowhere else is there available such a fund of information on wood of immediate value to the aircraft manufacturer as will be found at Madison. Upwards of 200,000 tests have been made on American woods, including practically all commercial species. The laboratory employs over 150 people. About half of these are technical men, and at present activities are all devoted to national defense work. Equipment is of semi-commercial size and is adequate for all kinds of strength tests on wood aeroplane parts, for tests of glues and finishes, for tests on kiln drying or the conditioning of wood, and for developing improved design.

The work upon the building and construction of aeroplanes seems to lie along the lines of mechanical engineering rather than along those of physics, although the department of physics of the University of Wisconsin is doing investigative work of the greatest service to the country in the undivided attention which Professor C. E. Mendenhall, now in Washington, is giving to the uses, construction and adaption of scientific instruments to aeroplane service. This includes instruments of many different kinds and purposes, including the problem of sending and receiving wireless messages, height estimations, the whole problem of aeroplane photography, and many other features, some of which are new and others of which are being improved by the splendid work which Professor Mendenhall is doing.

The future development of aeroplane service involves not only the investigation and estimation of the stresses and strains in the various parts of the aeroplane itself but of the different problems of the balance of the vanes or wings under the action of the wind and the elevating or lifting power which these have, depending upon the shape and inclination of the wing itself. A determination of these problems would necessitate the establishment of what is known as a "wind tunnel," in which reduced size models of the aeroplanes and of their wings are mounted and air driven past them to determine the proper curves and the proper angles of elevation. The University of Wisconsin is not, at the present time, equipped with such a wind tunnel, but it is quite likely that one may be established if this action is found necessary. There are eight or ten such tunnels in the United States at this writing and I think it has been felt that these are able to solve the problems that present themselves in this part of the study of aeroplanes.

Industrial manufacturers, who are contemplating the location of an aeronautic industry in the Middle West, should not overlook the important natural and man-made assets which Madison offers to this industry. Some time ago there was prepared by the Industrial Committee of Madison's commercial organization the why and how of a $200,000 industrial fund, and this plan of aid for substantial industrial development is ready to be put in operation. Madison believes that cities that are to hold their own must organize to fight as a unit in the struggle for industrial existence and all that that existence implies. Professional and business men of Madison stand ready to organize to do their part in fostering industrial enterprises if constructive industrial expansion is the result. The plans of other cities have been investigated and a credit guarantee and security investment plan has been evolved. The object of this plan is to provide a means of assisting industries and to do away with the old method of soliciting personal subscriptions to capital stock of bonds, without sufficient investigation on the part

(*Continued on page* 649)

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Rodenbaugh, Albert I.	UTA
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Russell, Franklin B.	DIK
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S

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Shutter, Arnold W.	FRF
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Stone, Thomas W.	TFT
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Stewart, Daniel Douglas	SLR; KST
Shaw, Phillips B.	KST
Shiell, Lyall G.	LST
Silverstein, Lee	KST
Spott, Carl E.	KST
Steele, Richard Wilson	SLR; VBW
Schlachter, Henry	SLR; RSD
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Santos, Alexander G.	BST
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Symons, Thomas W., Jr.	BST
Selff, Robert E.	DIK
Sands, Frank Thomas	SLR; DIK
Schaefer, Edgar Frederick	SLR; DIK
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Smith, Leonard L.	DIK
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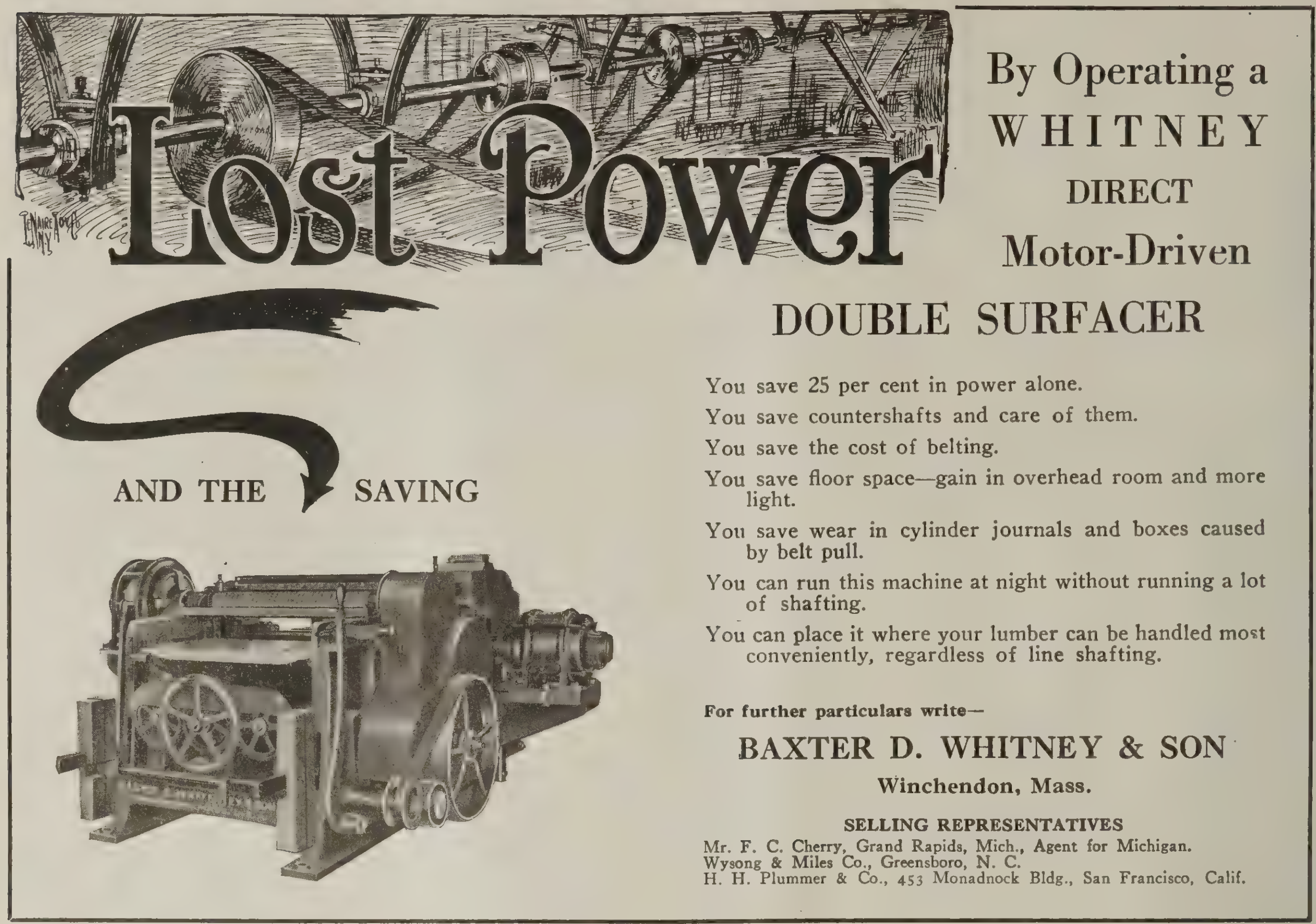

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Weise, Aaron L.	TFT
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Y

Young, Ora W.	FRF; DIK
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York, Philip S.	DIK

Z

Zapp, Julian E.	SAG
Zaiss, Leonard C.	FRF

Joseph A. Steinmetz Addresses Philadelphia Business Club

Philadelphia, Pa.—Mr. Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, in an address before the City Business Club of Philadelphia at Hotel Adelphia, urged his hearers to use the new aerial mail service for writing to the boys at the front. This will not only serve to encourage the extension of the aerial mail lines, but will assure our soldiers that our air forces are being built up. Mail sent by this means, he said, will receive preference in France. and thus will be greatly expedited in delivery.

Aviation Camp On Belmont's Farm On Long Island

New York City, June 3rd.—An aviation field for the training of fifty cadets at a time will be constructed immediately on 150 acres of Major August Belmont's Nursery Farm, two miles north of Babylon, L. I. It was announced that Major Belmont, who is in the Aviation Service, signed the lease with the War Department Friday in Washington. The consideration is $1 a year. The lease is for one year, with the privilege of renewal.

Erection of hangars and preparation of quarters for the students will start within a few days, it is said. No information concerning the name of the field nor its commander has been received. Included in the land leased is the Belmont one-mile training track.

(Continued from page 646)

of the investigators. This plan substitutes for this haphazard method used in the past, a fund of credit and cash, always available for immediate use, for the legitimate assistance of concerns needing the assistance, and providing the machinery in the shape of a board of experienced and competent men to make thorough investigations, such as cannot be made ordinarily by the average investigator.

Madison will welcome and aid those industries which, upon investigation, are found to need the raw materials which this center offers and which will enter into the plan of development as laid down by the Industrial Committee of the Association of Commerce.

After analysis and study covering a period of four years, it is the general verdict that Madison offers the greatest opportunity for industrial development along machine tool lines. In the development of aeroplane motors, machine shops, batteries, technical engineers, a forest products' laboratory, and the ability to develop machines to fit the needs are assets which Madison possesses. The fact that Madison is an inland waterfront city, at the same time having acres of water as experimental and testing grounds, is another asset from the aeronautic standpoint. From the standpoint of transportation, Madison is a hub with nine lines of railroads radiating out of the city like the spokes of a wheel. More places can be reached from Madison by railroad in twenty-four hours than can be reached from any other point in the State, including Milwaukee. Madison's unusual railroad facilities and its increased motive power should induce the investment of capital along manufacturing lines.

When the Government is training every nerve to expedite the production of its aerial program, every moment is of vital importance to the manufacturer. Madison stands ready to offer her facilities in pushing forward this program at a time when patriotic service is so essential to the nation and to our cause. Plants which are now employed in the production of other products will be converted to the production of essentials demanded in aerial development. Upon request, an analysis, technical and in detail, will be made for those who contemplate the expansion of this, our most important and vital industry.

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(*Continued from page* 627)

the first order. Recently, during the same flight, he burned an enemy observation balloon and destroyed an enemy aeroplane."

Another fine citation reads: "Houston Woodward, a corporal of the Foreign Legion and flying with a French squadron, a chasing pilot; daring even to temerity and always stubbornly seeking the enemy. On January 6th, 1918, he destroyed an enemy aeroplane far within the German lines and disappeared during a combat with several enemy aeroplanes."

Captain Charles John Biddle of Philadelphia, now lying in a hospital wounded, is mentioned thus: "A captain pilot with the Lafayette Squadron, remarkable as an officer and pilot, he succeeded recently in shooting down an enemy aeroplane."

Lieuteant Paul Frank Baer of Mobile, Ala., one of America's leading aces, is cited as follows:

"A lieutenant pilot with the Lafayette Squadron, a pilot of the very first order, distinguishing himself ceaselessly by his daring. In the space of four days he succeeded in destroying two enemy aeroplanes."

Baer is now reported to be missing and is probably a prisoner.

Lieutenant Charles Herbert Wilcox of Pasedena, Cal., has this citation:

"A lieutenant pilot with a French squadron, remarkable for his daring and enthusiasm; has destroyed a German aeroplane."

The Associated Press dispatch describing aerial operations says that Lieutenant Edward Rickenbacher, the former automobile racing driver, brought down his fifth opponent, making him an ace. Single handed Rickenbacher attacked two Albatross biplanes and three monoplanes. After he had fired a hundred rounds into one of the biplanes, it fell crashing to the ground. Returning from this combat, Rickenbacher suddenly saw four German aeroplanes flying toward him. Above him was Lieutenant Meissner attacking one of the hostile machines, when another German machine turned suddenly against Meissner. Meissner's machine collided with one of the enemy and a wing of the American's aeroplane was torn. Meissner immediately turned toward home, when a third enemy machine made for him. Rickenbacher fortunately was able to come to Meissner's assistance, and the two returned to the hangar safely.

The Associated Press reports great aerial activity on May 30th and frequent aerial battles over the Toul front. The Germans are reported to have bombed an American hospital far in back of the lines, resulting in the death of French nurses. The attack was described as deliberate, the Germans using flares to insure accurate placing of their bombs on the buildings bearing the Red Cross.

An American aviator was captured by the Germans on May 30th after his machine had fallen into No Man's Land.

May 31st

General Pershing's official communique says that "Early in the day our aviators shot down a hostile machine."

To Lieutenant Douglas Campbell goes the honor of being the first American trained aviator to be officially credited with five victories. Lieutenant Rickenbacher, who has downed five planes, is awaiting official confirmation of his victory of May 30th, in order that he may also be classed as an ace.

Lieutenant Meissner has been awarded a French War Cross for downing his first opponent. The fight took place at an altitude of 15,0000 feet.

An Associated Press dispatched dated May 31st states that in addition to the two aerial victories reported for May 30th, it is reported that two more German planes were downed over the American front.

It has been confirmed that the aviator captured by the Germans after landing in No Man's Land is Lieutenant Wilfred V. Casgrain, of Detroit, Mich.

June 1st

Reporting on operations on the American front on June 1st, General Pershing's official communique says:

"The enemy aeroplane referred to as brought down in the communique of May 31st was an Albatross biplane, shot down at 1,500 metres by Lieutenant Douglas Campbell in the region of Toul. Both pilot and observer were killed."

A supplementary night statement says that "our aviators shot down a hostile machine."

June 2nd

During a flight Sunday afternoon between four American planes and six German planes north of Toul, one of the American pilots shot down an enemy biplane. One of the attacking American planes was downed. Aside from this encounter, the Associated Press states that little other aerial activity occurred.

Adjutant Edwin C. Parsons, of the Cigognes Escadrille and formerly of the Lafayette Escadrille, has downed his fifth German plane, according to information received by his father.

Sergeant L. Baylies, of New Bedford, Mass., was cited for a first lieutenancy in the French army aviation service and awarded the decoration of the Legion of Honor. The official compilation credits Sergeant Baylies with bringing down eleven German machines.

Captain Charles J. Biddle, of Philadelphia, an American aviator and formerly of the Lafayette Escadrille, is named in the casualty list of June 2nd as having been wounded in an aerial combat.

To Make Camp Greene Great Aviation Centre

Washington, D. C., June 1st.—Secretary Baker announced that Camp Greene, Charlotte, N. C., would be made a great aviation concentration camp, at which about 15,000 men will be assembled. The remount depot at the camp will be moved elsewhere. No commanding officer for the camp has been assigned.

Lieutenant Spencer Owens Shotter, of Savannah, Ga., aviator in the Signal Reserve Corps, married Miss Marion Townsend, of New York City.

Katherine Stinson Finishes Mail Flight

Sheepshead Bay, N. Y.—Miss Katherine Stinson, who started from Chicago on May 23rd with mail for New York, arrived on June 1st at Sheepshead Bay Race Track in the midst of the Harkness Trophy Race. The first lap of her journey—from Chicago to Binghamton—was a non-stop flight of 783 miles, but owing to a series of accidents, the flight was not resumed until June 1st, nine days after landing at Binghamton.

Miss Stinson left Grant Park, Chicago, at 7:37 A.M., May 23rd, carrying Government mail which she expected to deliver in New York before night. She was forced, however, to land two miles north of Binghamton at 6:40 o'clock that night as her supply of gas was exhausted.

AERIAL AGE WEEKLY

Vol. 7, No. 14 JUNE 17, 1918 10 CENTS A COPY

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A remarkable demonstration of formation flying at one of the American Training Fields.

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$28,000,000 Emergency Appropriation Asked for Aerial Coast Defense

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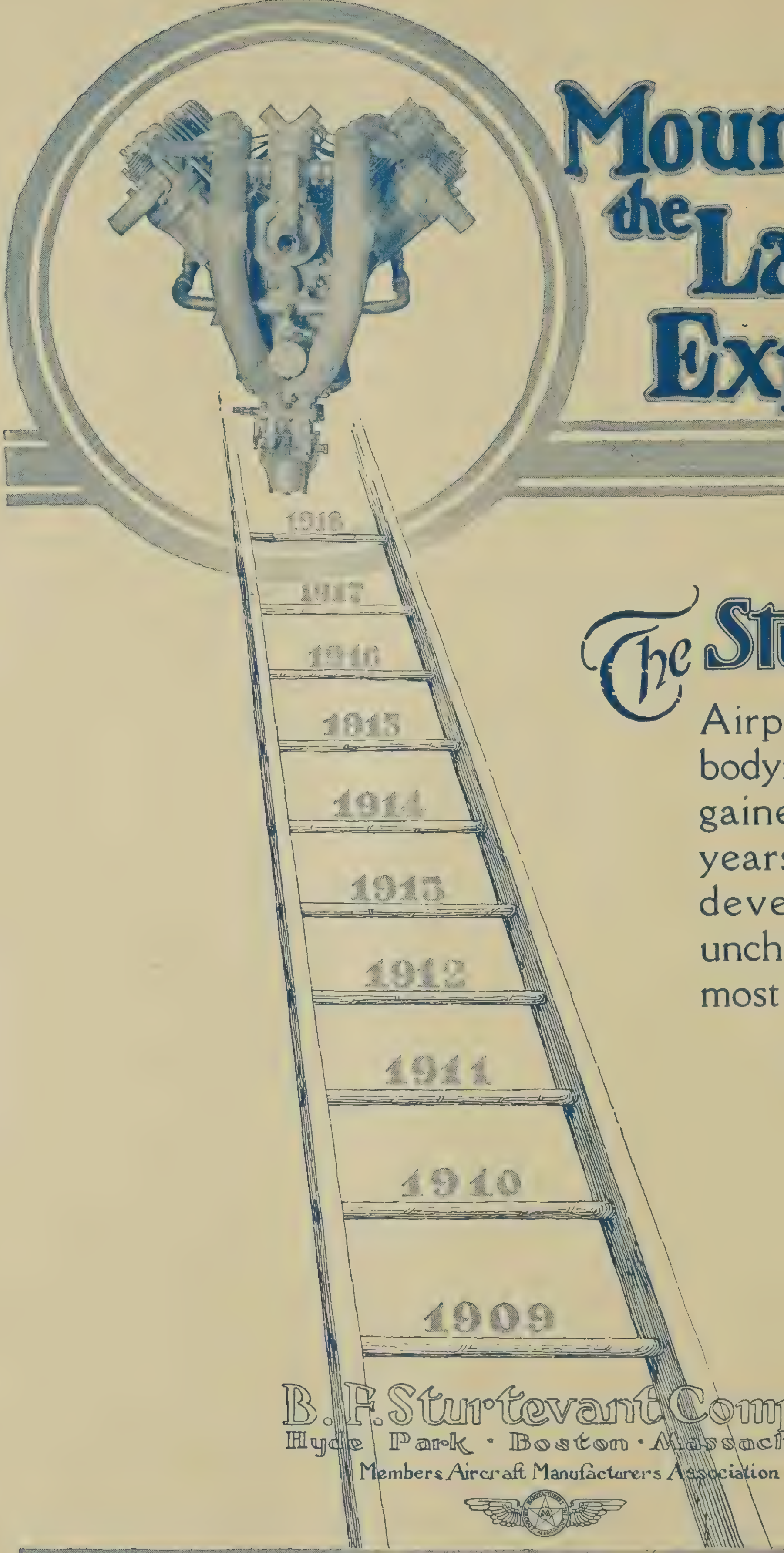

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WEEKLY

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VOL. VII NEW YORK, JUNE 17, 1918 No. 14

$28,000,000 EMERGENCY APPROPRIATION ASKED FOR AERIAL COAST DEFENSE

EMERGENCY estimates amounting to about $28,000,000 for the purpose of establishing permanent aeroplane and balloon stations on the Atlantic and Pacific coasts, in Hawaii and the Panama Canal Zone, were sent to the House Appropriations Committee on the sixth of June by Secretary Baker.

The destructive excursion of German submarines to the Atlantic seaboard is mainly responsible for the estimates. It is understood that sites have been selected for thirteen stations on the Atlantic, three on the Pacific, three in Panama and three in Hawaii.

In addition twenty balloon coastal stations are planned by the War Department at the several coastal points suitable for observation. The names of the sites selected were withheld because purchases have not been completed. Estimates submitted are in detail as follows:

Construction of sixteen permanent coastal stations, $16,000,000.

Construction of twenty permanent balloon coastal stations, $2,500,000.

Construction of four permanent stations in Panama, $5,500,000.

Construction of three permanent stations in Hawaii, $4,420,000.

The desired amounts will be included in the fortifications bill soon to be reported by the House Committee.

Representative Borland, chairman of the sub-committee on fortifications, according to prior despatches, said he understood the submarine situation brought on the supplemental estimates.

"The presence of German submarines off the Atlantic coast is doubtless responsible for the submission of these additional estimates," said Mr. Borland. "These stations may be quickly built; I believe it takes about six weeks to construct them.

Likely to Get Full Amount

"In the original estimates for the army I understand provision was made for several aeroplane stations to be provided out of a lump sum appropriation, but the estimates submitted are specifically for that purpose, and the Appropriations Committee has jurisdiction to include the amount in the fortifications bill. The larger amount asked becomes necessary because of the aid aeroplanes and balloons may render in hunting down the U-boats wherever they may make their appearance."

With thirteen aeroplane stations on the Atlantic Coast and numerous balloon observation stations this country will have within reach for observation and bombing at almost any point aeroplanes, hydroplanes and balloons. These aerial submarine chasers will patrol the seas and make doubly hazardous the work of the U-boats. There is little doubt the full amount asked by Secretary Baker will be allowed by Congress.

The Secretary wrote to Mr. Borland stressing the importance of making immmediately available funds for a large number of permanent bases for aerial observers. This letter was not made public.

Railway to Be Equipped with Anti-Aircraft Guns

American railways running along or within a few miles of the Atlantic Coast will be utilized to cary anti-aircraft guns in the event of a German aeroplane raid. This plan of protecting even the small hamlets that dot the long reaches of the coast has been discussed by New York and Federal officials. One of the former said:

"The proposed new balloon and seaplane stations to guard against submarine and air attack can be utilized nicely as storage points for mobile anti-air craft guns which are intended to be transferred quickly from one point to another to meet threatened attack.

"For the sake of illustration, say there is created one zone from New York to the Jersey Highland, with three storage points in the zone. Word comes of a possible attack on Asbury Park, say. Within a few seconds the railway cars containing the anti-air craft guns would be on their way and the German aeros would meet the surprise of their lives with guns belching at them from unexpected points.

"Ordinance experts consider it feasible to mount guns of sufficient calibre for this work in reinforced freight cars of special construction. The cars could be thoroughly protected and camouflaged also."

Alan A. Ryan, Deputy Police Commissioner, discussed details in Washington of the new coast defense plan with War Department officials. He also made a report on the enforcement in this city of regulations to guard against a surprise attack from the air.

On the third "dark evening" New York was dimmer by night than ever before in its history, and this includes the Garfield nights of winter memory. Fifth avenue joined Broadway as an "ally of darkness." More than half the cluster lights in Fifth avenue, which were going full blast on Tuesday night, were darkened on stringent police orders.

The few cluster lights which were ashine were furnished with considerably diminished power, so that their rays were cast only a few rods. Broadway, even, was darker than in the last two nights, most directional signs even being extinguished.

The East River bridges were far more dim than on the previous evenings. This applied also to the Williamsburg and Queensboro Bridge plazas.

AERO MAIL EXTENDED TO INCLUDE NEW YORK-BOSTON SERVICE

ANOTHER step in the evolution of the aero-mail service was made on June 6th when Lieut. Torrey St. Webb carried four thousand letters from Belmont Park, Long Island, to Boston in three hours and twenty-two minutes, the distance being 250 miles.

With R. Heck, a mechanician, as passenger, Lieutenant Webb got away from Belmont Field at 12:09 o'clock. The start was witnessed by Richard Vreeland, Assistant Superintendent of Mails; H. L. Hartung, in charge of the Aerial Mail Service; Alan R. Hawley, President of the Aero Club of America, and Henry Woodhouse, a member of the Board of Governors of the Aero Club of America. Two hours later, as the aviator neared Haddon, Conn, he found that his compass was working badly and he descended at Shailerville and fixed it.

At 3:31 o'clock Lieutenant Webb circled over Saugus, Mass., near Reverve Beach and Boston, and then planed down on the estate of Godfrey Cabot, President of the Aero Club of New England, now the Franklin Park Aviation Field. In making the landing he struck soft earth, and the machine tipped up. Webb and the mechanician were thrown out but were uninjured. The plane was severely strained and one propeller blade snapped off.

Assistant Postmaster William E. Hurley of Boston and other Post Office officials were on hand to greet Lieutenant Webb, and the mail was transferred to a motor for delivery in Boston.

On the return journey from Boston to New York, Lieut. Wedd carried Postmaster Murray of Boston as a passenger.

"I have had a wonderful day, full of life, action, and thrills," said Postmaster Murray. "I am confident that we shall soon establish an air mail service that will maintain a regular schedule each day between Boston and New York. I am enthusiastic over the Liberty motor. We had no engine trouble at any time on our trip."

The New York-Philadelphia-Washington aero-mail service is giving great satisfaction in official post office circles, and in a comparatively brief time new routes will be established in the Middle West.

"The success obtained in operating the aeroplane mail service," said Postmaster General Burleson recently, "exceeds what I expected of the new route duirng its initial stages. The army has rendered a splendid service, which is not only a distinct contribution to the commercial world but is proving valuable training for the aviators who are about to enter upon a greater task in France."

Bill for Federal-Controlled Aircraft Corporation Introduced in Congress

AT the request of John D. Ryan, in charge of aircraft production, Senator Chamberlain, Chairman of the Committee on Military Affairs, on June 10, introduced a bill for the creation of a $100,000,000 corporation to handle aeroplane construction.

The purpose of the measure is to speed up still further the production of aeroplanes for the American Army and to put the whole matter on a strictly business basis. Under Senator Chamberlain's bill, the new corporation is to be Government controlled, and is to have the most complete charge of aviation from the production angle.

Mr. Ryan's reason for requesting passage of such a measure by Congress as stated in the press is said to have been his belief, that in no other way could he so effectively organize for speedy production, at the lowest cost compatible with good results, as under a corporation charter.

The Military Affairs Committee is to consider the measure at once, and is expected to report it without delay.

Congressman Dent Presents Aircraft Figures to Military Committee

DEFINITE figures on the production of aeroplane motors were submitted to Congress on June 7 by Representative Dent, chairman of the House Military Affairs Committee. Up to May 18, he said, 5,294 planes actually had been delivered to the Government by the factories. A large proportion of these, 4,365, were elementary training planes. Advanced training planes to the number of 620 were delivered.

Only 114 combat planes were completed and turned over to the Government at this date. In addition, 195 experimental planes were manufactured. They were designed mainly for the purpose of trying out new ideas in aviation and in finding the types of planes best adapted to certain kinds of motors.

Engines were manufactured in greater number than planes but were in a somewhat similar ratio. Those for elementary training were 6,126, for advanced training 1,825 and for combat 1,043, a total of 8,994. The reason for the advance in the proportion of combat engines is that in actual service it is necessary to have a greater number of engines for every plane than in training. Facilities for manufacture also figured in the output.

Mr. Dent said 31,846 machine guns had been delivered, but the Signal Corps has not received its allotment from this number. Although 843,735 bombs largely for aeroplane work had been ordered none had been delivered on May 18. Of 1,077 balloons contracted for 120 had been delivered.

The United States has twenty-seven flying fields, including two fields started Thursday, June 6. There are also seven ground schools for flying officers and two schools for non-flying officers. The United States has 3,467 aviators at home and 1,746 abroad, a total of 5,646. Altogether the Signal Corps has an enrollment of 99,001 enlisted men in the United States and 38,367 abroad, a total of 137,368. More than 4,000 men are awaiting assignment to ground schools. The number in attendance at the ground schools is 3,394 and at the primary flying fields in the United States 3,398.

There are 152 receiving instruction in the pursuit schools, 432 in observers' schools, 542 at bombing schools and 1,036 at the advanced schools. Balloon observers also are receiving training on this side, 316 receiving instruction at this time.

According to the figures of Mr. Dent, seven American aerial squadrons are actually at work over the American lines. This does not include American planes that have been cooperating with the French and have not yet been assigned to an American aerial unit.

The Aircraft Investigations

June 4

THE Sub-Committee of the Senate Committee on Military Affairs including Senators Charles S. Thomas, Colorado, chairman; Hoke Smith, Georgia; James A. Reed, Missouri; Joseph Frelinghuysen, New Jersey, and Harry New, Indiana, expected to complete, on June 4, a two-day inquiry into the progress of the aeroplane production so far as the plant of the Curtiss Aeroplane and Motor Company are concerned.

Senator Thomas of Colorado, speaking personally, and as reported in the press, said that what had been found so far had been gratifying.

"They are doing more toward the production of aeroplanes than we had reason to expect and there appears to be prospect of a greatly increased production," he said.

June 5

Nineteen thousand Liberty motors, produced mainly in Detroit, will have been delivered to the government by September 1, 1919, according to members of the committee in charge of the Senate Investigation into aircraft production who arrived at Detroit June 5 to inspect local factories. Senator Hoke Smith of Georgia was the only member of the committee absent.

Senator Thomas of Colorado, chairman, said the Government "needs aeroplanes on the French front and needs them badly."

June 6

The Senate Sub-Committee, who are visiting Detroit to inquire into the production of Liberty motors and aeroplanes, express the opinion that manufacturers here have not been remiss in efforts to produce, and they are not profiteering.

Senator Charles S. Thomas of Colorado, Chairman of the sub-committee, said, according to press reports:

"Production of Liberty motors here in Detroit has not been sufficient to satisfy needs; it has not been up to expectations, but it has been commensurate with possibilities. There is every evidence that difficulties have been overcome and organization perfected and that the local makers of this engine are on the eve of very great production. I don't want to say that the committee is satisfied with production, but we are satisfied with prospects. There are matters to be remedied which I can't talk about now."

June 6—Hughes Investigation

Gutzon Borglum, whose sensational accusations against officers and others connected with Government aircraft production, were aired before President Wilson asked Charles E. Hughes to act with Attorney General Gregory in investigating such charges, was examined to-day by the Attorney General, Mr. Hughes and Assistant Attorney General Frierson. He was closeted with the investigators all day, his testimony being recorded in full by stenographers.

It is understood Mr. Borglum told in detail of how he first became interested in the nation's aeroplane programme and of the facts he uncovered in his investigation with the sanction of the President. He also is said to have explained his connection with an aeroplane manufacturing project of which he was one of the promoters. His testimony was not made public and officials declined to say whether he would appear again.

Another investigation under way by the Department of Justice to determine whether there was graft or extravagance in connection with the Government shipbuilding plant at Hog Island will not be completed for some time. Assistant Attorney General G. Carroll Todd, in charge of the inquiry, said to-day he did not know how much longer the work would take.

June 9

Members of the Senate Military Sub-Committee investigating aeroplane production, returned to Washington June 9 after visiting plants in Buffalo, Detroit, Indianapolis, and

(*Continued on page* 692)

THE NEWS OF THE WEEK

Orville Wright Believes Aero Attack Possible

Dayton, Ohio.—That an attack from the air by a German aeroplane at this time is only a remote possiblity is the sentiment expressed today by Orville Wright, inventor with his brother, the late Wilbur Wright, of the first heavier than air flying machine.

"It is entirely within the realm of possibility to transport an aeroplane of a smaller type from Germany to the shores of New York," said Mr. Wright. "A machine could be knocked down and stored in a submarine of sufficient size and capacity, but aeroplanes that bombed cities in this war are of the bombing type, entirely too large and massive to admit of transportation by submarine. A smaller machine could do but little damage over New York and the pilot would have to understand the minute he shot from the submarine that he was on a hazardous mission.

"Assembling an aeroplane on top of a submarine would require an unusually quiet sea and the submarine would, of course, have to ride on the surface of the ocean, a perilous thing just now. The enemy will be working at a tremendous disadvantage if he undertakes to make an aeroplane raid upon our Eastern ports," said Mr. Wright.

Such an attempt on the part of Germany would only serve to stimulate our people to greater enthusiasm and excite a more militant spirit throughout the entire nation.

Aeroplanes in Enemy Radio Hunt

Atlantic City, June 8th.—Aeroplanes are assisting in searching a wood in New Jersey which is suspected of concealing wireless apparatus used by German agents in communicating with submarines off shore.

New Air Service Insignia

Washington, D. C.—The General Staff has under consideration several designs of insignia for the Air Service, but no insignia has been definitely settled upon. An officer assigned to any branch of the Service for which no distinctive insignia is provided wears the insignia of his regular branch. An officer who has been called to service from the Reserve Corps or assigned to special duty, and also unassigned officers, may wear the special service insignia, which is the coat of arms in a circle; or it may be better described as a cut-out coat of arms surrounded by a circle. It has been decided not to continue the use of the coat of arms superimposed on a disk which was formerly worn by officers on special assignment.

Air Raid Precaution Continued

As we went to press last week notice was made of the Police Commissioner's order that all unnecessary lights in New York City should be darkened. The precaution is being continued and subsequent regulations issued.

Commissioner of Police Enright has issued the following instructions:

"The Police Department desires to notify all residents of the city through the press, that in the event of raids on this city by enemy aeroplanes the following signals will be given:

"Siren horns or whistles will be sounded continuously for ten minutes. When this signal is given every one should immediately open the windows of their homes or offices and go at once to the cellar of the premises.

Major John Purroy Mitchel, ex-Mayor of New York, now stationed at the North Island Aviation School at San Diego, Cal. © Committee on Public Information

"When the danger has passed a signal will be given by short blasts of siren horns or whistles at intervals of one minute each for a period of twenty minutes."

Fifty aeroplanes from the Hempstead aviation field have been patrolling the coast between Coney Island and Montauk Point in search of submarines. They were all equipped with machine guns, bomb dropping devices, and each carried a cargo of bombs. They flew in fleets of eight, in V-shaped formation.

Similar flotillas have been operating from Bay Shore, New London, Conn., and Block Island. The coast has been divided into zones and each fleet will operate in its own zone.

Signal Corps Needs Radio Experts

Washington, D. C.—An appeal for enlistment of radio and buzzer operators has been made by the Signal Corps.

The demand for specialists in the American Army is increasing daily. Mechanics and technicians of every kind, including radio, buzzer, telegraph, telephone and cable operators.

It is important and interesting work, since without this branch of service the Army's "ears" would be stopped and in many instances its "eyes" would be valueless. Men who are expert telegraph and radio operators in civil life have an opportunity here to continue their specialty.

In nearly every large city the Federal Board, through local school authorities, has established schools of radio communication where all men of draft age who have not yet been called may receive preliminary training in the operation of buzzer and radio instruments.

The Signal Corps is particularly in need of highly trained technical personnel. Electrical engineers and men with good fundamental training in engineering or physics will find excellent opportunities for service of a character which will permit them to make use of their training and experience. Men of satisfactory qualifications are given three months' training in special Signal Corp's schools, operated under the supervision of the Land Division of the Signal Corps, and are given every opportunity to take examinations leading to promotion.

Acroplanes for Independence Day Unity Parade

New York City, June 5th.—At a meeting of the Mayor's Committee on National Defense, Augustus Post, representative of the Aero Club of Ameirca and honorary secretary of the Aerial League of America, proposed that an air parade be made part of the pagaent parade, which was being planned for Independence Day.

"Not only," he said, "would there be American air squadrons, if they can be spared from the hunt for Hun submarines, but Italian and French planes along the line of march."

The National Government was represented at the meeting by Collector of the Port Byron D. Newton, and among those assisting in the deliberations were Captain Whitwell, head of the British War Mission; A. S. Somers, President of the Board of Education; Henry McDonald, Chairman of the Mayor's Committee on National Defense; Joseph Appel, representing John Wanamaker, and other prominent citizens.

Aero Map of Kelly Field Being Prepared

An aerial map of the great army aviation training field at Camp Kelly, near San Antonio, Texas, requiring more than 40,000 photographic exposures, is being prepared at the section of Reconnaissance Photography of the Flying Department. A considerable section of the map has already been prepared. Many of the individual photographs, taken by aviators, have been assembled, and when complete the map will give a birdseye view of the field.

The photographs are taken from aeroplanes flying at a height of 5,000 feet and traveling sixty to seventy miles an hour. Each photograph covers an area of two-fifths by three-fifths of a mile. When finished, they are placed together and form sections of the map.

New Aerological Stations Planned

Suitable sites for additional aerological stations for the observation, measurement and investigation of atmospheric phenomena in the aid of aeronautics have been selected by the Weather Bureau at Broken Arrow, Okla.; Ellendale, N. Dak.; Droesbeck, Tex.; Leesburg, Ga.; and Royal Center, Ind. This was done under the Army appropriation act for the year ending June 30, 1918, authorizing $100,000 for this purpose. Installation of equipment has been completed at the Ellendale station and daily free air observations are being obtained. It is expected that free air observations will be begun at the other four stations about July 1st. The work to be conducted at all of these stations is similar to that at Drexel, Nebr., where daily kite flights are made, and about twice each month the atmospheric changes during the day at different altitudes are studied by means of successive flights continuing from 30 to 40 hours.

A group of Nieuports at an aviation field in France getting ready for the day's work. © Committee on Public Information

© Committee on Public Information

Aviation cadets working on the clay pigeon rifle range, North Island, San Diego

British Aircraft Ministry Officials

London, Eng.—According to information given in Parliament, the following is a partial list of the principal departments and the names of officials in charge of the Ministry of Munitions:

Finance Group: Aircraft and Explosives Finance, Sir Philip Henriques, K. B. E., director.

Ordnance Group: Controller, Timber Supplies, Mr. D. Ba n, C. B. E.

Air Group: Aircraft Production, vacant. Assistant Director General, Sir Henry Fowler, K. B. E. Controllers: Supply, Brig. Gen. W. Alexander. Technical, Lt.-Col. J. W. Weir, C. M. G. Director, Inspection, Lt.-Col. R. K. Bagnall-Wild. Controller, American Assembly, Mr. Alexander Duckham.

Augustus Post Gives Aviation Lecture

White Sulphur Springs, W. Va.—Greenbrier sojourners heard a most interesting talk on aviation when Augustus Post, Honorary Secretary of the Aerial League of America and acting secretary of the Foreign Service Committee of the Aero Club of America, talked on the aviation programme in the war. Official pictures of aviation in France, authorized by the French Government, were shown.

Naval Aviation Enlistments Open

The commandant of the Third Naval District, 280 Broadway, has requested us to publish the following news items concerning enlistment in the Naval Aviation section:

> Here's a chance to enroll in the United States Naval Reserve Force and work at your own trade.
>
> The naval aviation section needs a great number of men immediately. Good ratings and good pay are possible for qualified men.
>
> Here is the list of ratings and the necessary trades.
>
> *Machinists' Mates*—General machinists, automobile mechanics and assemblers, toolmakers, diemakers and similar mechanical trades.
>
> *Quartermasters*—Cutters and cloth fitters, upholsterers, canvas workers, painters, tent riggers.
>
> *Carpenters' Mates*—Woodworkers of all kinds.
>
> *Blacksmiths*—Toolsmiths, forge men, furnace men, etc.
>
> *Coppersmiths*—
>
> *Shipfitters* and all kinds of sheet metal workers.
>
> Applicants must be American citizens from 18 to 35 years of age. Draft registrants will be accepted upon presentation of a letter from their local boards.
>
> Men of the foregoing trades will be sent to school for special training. Applicants may enroll at 51 Chambers Street, New York, or at any Naval Recruiting Station in the United States.
>
> There you are. Now sign up and help the Navy Airboats get the U-boats."

Washington to Boston Sky Post Route Being Charted

Meterological observations were taken by Lieut. James C. Edgerson, of Washington, Wednesday in a flight between Washington and Philadelphia. The readings of the instruments were announced by the Post Office Department.

Flying over Laurel, Md., at an altitude of 15,300 feet, the pilot found the temperature reading at 60 degrees, while it registered 90 as he left the ground at Potomac Park in Washington.

Wind velocity was materially decreased at this high altitude, and the engine power slightly reduced. The tests were made in a new plane. The Post Office department officials are seeking an air lane which will permit fast flights in the delivery of the mail.

Chanute Field News

Rantoul, Ill.—It has been announced that a trainer for the flyers will be sent to Chanute Field in the near future, whose duties will be to see that aviators are fit for flying before they make their trips. This plan of placing a trainer in Government aviation camps has been urged by Walter Camp, the well-known authority on sports, and the Aero Club of America.

Flyers from Chanute Field made a cross country trip to the Ravisloe country club, near Chicago, on June 8th to boost the Red Cross Golf Match. Chick Evans and Jerome Travers were among the participants in the match. A large sum was raised.

The University of Illinois baseball team defeated the Chanute Field nine recently by a score of 13 to 4. The game was witnessed by a large proportion of the cadets and local enthusiasts.

British Like Liberty Motor

Tests of the Liberty motor made in England "place the engine at once in the first line of high-powered air engines," the British Air Minister cabled Lord Reading, British Ambassador to the United States.

"The British technical authorities," said the message, "have reportd to the Air Minister that the Liberty engines have now been subjected to sufficient air experiments in England to warrant confidence in this engine. Excellent results have so far been obtained, which place the engine at once in the first line of high-powered air engines.

"Naturally service experiment in the field is still to be obtained, but the Liberty engine will be a most valuable contribution to the allied aviation program, and the United States should develop production with every confidence.

Post Graduate Course in Executive Work

An order just issued by the Director of Aeronautics makes provision for special training along executive lines for all such newly-made officers who may show ability in the conducting of the departments which go to make up a military post. A post graduate course in the management of offices like Disbursing Officer, Supply Officer, Engineer Chief, Executive Officer and similar positions is prepared for them. There seems to be a dearth of such officers.

Inquiry Into Aero Accidents Proposed

Washington.—A resolution calling for a Congressional investigation of accidents at Aviation Camps was introduced June 5 by Representative Husted, of New York.

Accidents in the last five weeks, the resolution says, show that some have been due to defective construction or negligent inspection.

Bruner in Flight for W. S. S.

Harold M. Bruner, a youthful aviator, made his initial flight of the season on Decoration Day, when he gave three successful exhibitions before a large crowd at the Erie Exposition. He dropped literature in aid of War Savings and Thrift Stamps. A special permit was obtained from the Joint Army and Navy Board to allow him to make this exhibition flight. He has applied to Washington to enter the Naval Air Service.

At the Aviation Training Schools and Camps

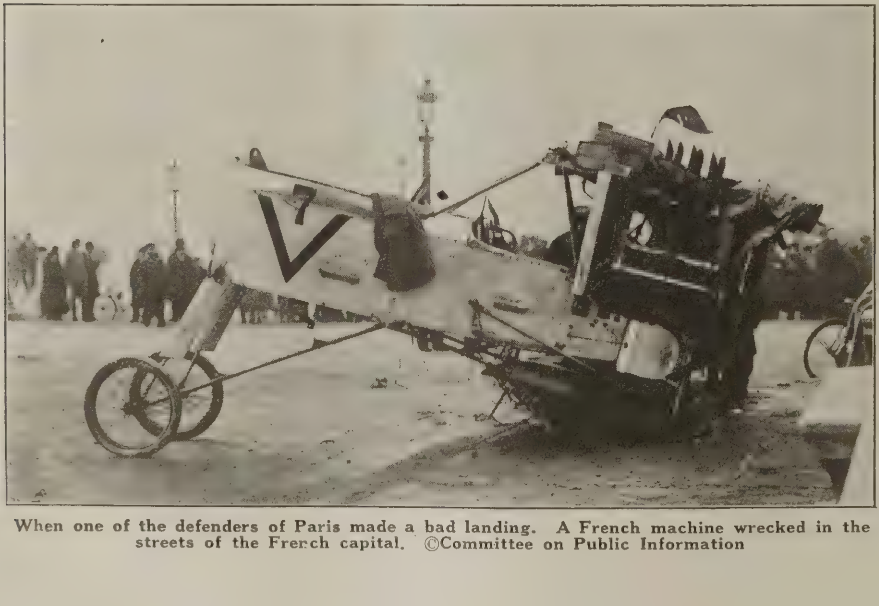
The commandant of the Dunwoody Naval Training School has been authorized to enroll a second unit of twenty-five men as student officers for the Naval Reserve Flying Corps for ground training at Dunwoody. Men of the first unit, having successfully passed their examinations upon arrival at the Massachusetts Institute of Technology, have been detailed in small groups to Akron, Pensacola, Miami and Key West for fighting training. Chief Master-at-Arms W. Eastman, U.S.N.R.F., who was in charge of the first unit, has returned to Minneapolis, however, and has been commissioned ensign to assist in the instruction of the new recruits.

The flying season was officially opened at the U. S. Naval Training Station, Great Lakes, Ill., when Lieut. Lee Hammond and Ensign D. P. Forbes made a tryout flight over the camp. Flights will be made daily for the remainder of the season, weather permitting.

To facilitate flying at the lake, a new south entrance is being constructed on the boat house.

Camps and Schools

A most peculiar accident happened near Babylon, L. I., on June 3rd. A marine aeroplane attached to the naval station at Bay Shore, during a manoeuvre today, struck the top mast of the Commodore, a sailing yacht belonging to John Vanderveer, and then tumbled headlong into Great South Bay. The accident accurred a short distance out of the bay, between Babylon and



When one of the defenders of Paris made a bad landing. A French machine wrecked in the streets of the French capital. ©Committee on Public Information

Bay Shore. The pilot was endeavoring to make a circle just above the vessel, but misjudging his distance drove the nose of his plane against the mast.

The pilot was rescued by a crew from the naval station.

Two American aviators, Ensign Roleau and Mechanic Harrington, were brought to port on June 4th by a U. S. patrol boat, which had rescued them from their disabled hydroaeroplane adrift ten miles southeast of Sankaty Head, at the east end of the island. The machine sank soon after the two men were taken off. They had been forced by engine trouble to alight on the water on June 3rd.

Camp John Wise, the balloon observation school, is to be further enlarged. It is reported that approval has been given for taking over 44 acres near the school.

As originally laid out, Camp John Wise was located on 60 acres of land. Since its establishment, it has been twice increased in size.

May 24th

Lieutenant Edward Rickenbacher, of Columbus, Ohio, has shot down his third enemy machine. The latest victory was achieved near Thiaucourt.

An American aerial pursuit squadron is operating over the American sector northwest of Toul. All the pilots whose air exploits have been recorded up to this time belong to this squadron, which has a special insignia. The squadron is flying Nieuport chasing machines.

General Pershing's official communique of May 24th reports that "In Lorraine on May 21st a hostile aeroplane flying over our lines was disabled and forced to land in our own territory. There it was destroyed by our artillery fire adjusted with balloon observation."

An American Escadrille, composed of aviators chosen from among the best American pilots, in the future will help to defend Paris against enemy air raids.

Offer of this help was made spontaneously by the chief of the American Aviation Service and accepted by the French Government through M. Dumesnil, Minister of Aviation.

Corporal R. Sidney Drew, son of Sidney Drew, well known on the screen and the stage and a nephew of John Drew, the actor, who enlisted in the French aviation corps in 1917, was shot down in a fight with an enemy plane inside the German lines, according to information received in New York.

Major Raoul Lufbery left his life story two-thirds written. His comrades say it was one of the most thrilling books of the whole war. Lufbery was writing the book in French, and Captain David Peterson was translating it into English. The American aviators are urging Peterson, who was Lufbery's closest friend, to finish the book immediately. It is not only literature, but it is believed it would be vital in stirring up America.

May 25th

Lieutenant Edward Buford, Jr., of Nashville, Tenn., shot down a German aeroplane near St. Mihiel in a daring battle over the German lines. Buford was attacked by four enemy aeroplanes. He picked out one of the fliers and gave battle, who attempted to maneouvre him into the center of the other German fliers. Huford, however, eluded them, quickly swinging homeward. One of the Germans tried to head him off with the result that he went crashing to earth.

A dispatch from the American headquarters on the British front, cabled by the Associated Press on May 25th, reports that four American aviators have been brought down over the German lines.

May 26th

The Cross of War was given to Lieutenants Walter V. Barneby, Pilot, of Oklahoma, and Kenneth B. Culbert, observer, of East Orange, N. J., for their courage and skill on a trip over the enemy lines, which resulted in the death of both. They were making observations over an important sector of the German line when bombarded by powerful aircraft guns. Despite the heavy barrage, they completed their task, but in returning their crippled machine toppled to the ground when just over our lines.

Lieut. Douglas Campbell, the first American trained "Ace," is reported to have been slightly wounded in a fight with another German aeroplane.

The honor of being known as his country's first American trained "ace" was earned spectacularly by Lieut. Douglas Campbell on May 31st in a twenty-minute air battle. Campbell downed his first enemy aeroplane on April 15th, his second on May 21st, and three more in the subsequent ten days.

College Training for Drafted Men

Washington, D. C.—Special training of drafted men by universities and colleges is working successfully. The committee on education and special training of the War Department, in a report, shows that the University of Pittsburgh is training 650 men for service as gas engine and automobile mechanics in the army. When the plan was announced in March, the University of Pittsburgh discussed provisions of training and housing 100 men. Less than a month later 326 men were taking instruction, and this number has since increased to 650. It is anticipated that the number will reach 2,000 by August 1st.

The work at this university is confined to the training of gas engine and automobile men. The equipment facilities for this work are particularly complete at this university.

Paris-London Air Mail

Paris.—Aviators De Vienne and Lorgnat flew from Paris to London and back in a hydroaeroplane in three hours and ten minutes, carrying mail, on May 28th.

It was the first trip in connection with an aerial postal service between England and France which is being organized.

THE EVOLUTION OF AERO ENGINE WEIGHT

THE War Department authorizes the following statement of evolution in aircraft engines prepared by the National Advisory Committee for Aeronautics:

The first man-carrying aeroplane flights were made in December, 1903, with the Wright Brothers' engine developing 12 horsepower and weighing 152 pounds or 12.7 pounds per horsepower. In 1910, seven years later, the average horsepower of aeronautic engines had increased to 54 and the weight decreased to 5.7 pounds per horsepower. In another seven years, 1917, the average power output had advanced to 243 horsepower and the weight decreased to 2.8 pounds per horsepower. In March, 1918, the Liberty twelve developed 432 horsepower for a weight of 808 pounds or 1.86 pounds per horsepower. At the present time, May, 1918, the Liberty twelve is yielding a maximum of 450 horsepower for a weight of 825 pounds, or 1.83 pounds per horsepower.

The following table shows the advance in the average power-weight ratio by years for the engines in actual flying use. It is to be especially noted that the Langley-Manly engine, built in 1901, was nine years ahead of its time in the matter of power output and sixteen years ahead in its weight per horsepower.

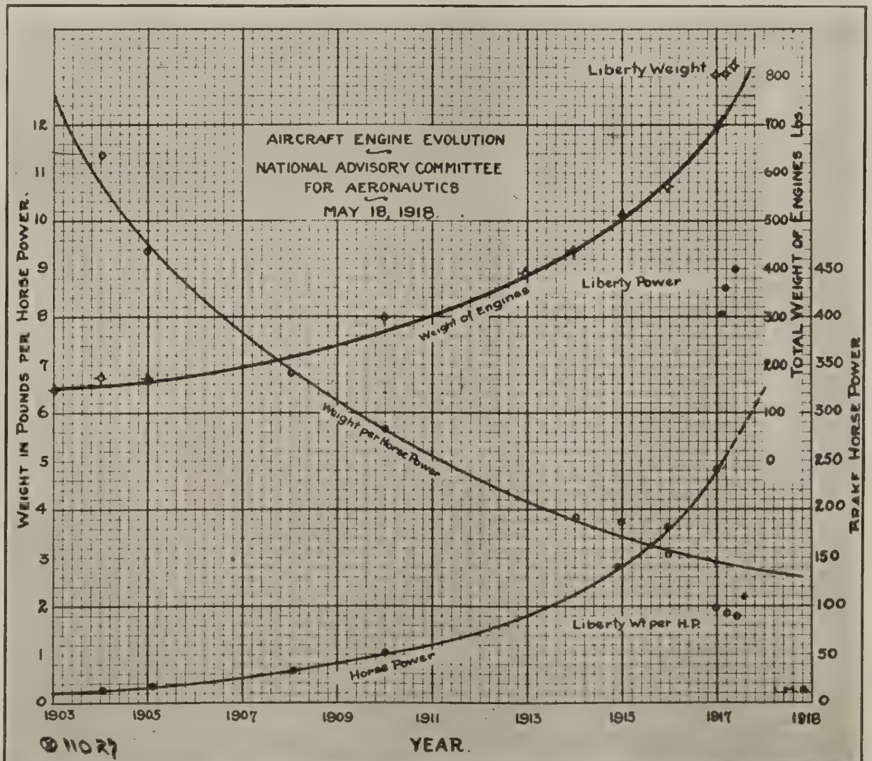
In 1917, the Liberty twelve was 65 per cent more powerful and 28 per cent lighter per horsepower than the average in service for that year. So far this year, these figures are probably changed to 50 per cent and 25 per cent respectively, which indicate the advance of the Liberty over the average engine in service at the present time.

AIRCRAFT ENGINE EVOLUTION

	Year	Horse Power	Wt.	Wt. per H.P.
Langley-Manly Engine..	1901	52	151	2.9
Original Wright Bros...	1903	12	152	12.7
Improved " " ..	1904	16	180	11.4
" " " ..	1905	19	180	9.5
Redesigned " " ..	1908	35	182	5.5
Average on market.....	1910	54	309	5.7
Wolseley Engine.......	1913	147	720	4.9
Average on market.....	1914	112	437	3.9
" " "	1915	133	512	3.8
" " "	1916	185	570	3.1
" " "	1917	243	693	2.8
Liberty 12 Cyl.........	1917	400	801	2.0
" " " (March)	1918	432	808	1.9
" " " (May)	1918	450	825	1.8

The average consumption of fuel decreased from about .8 pounds per horsepower in 1903 to about .65 pounds in 1914, since which it has slowly dropped to .55 pounds in 1918, and, for the Liberty, to .50 pounds. The present Liberty consumption is approximately .46 pounds per horsepower hour.

Illustrating the advance made, the Wolseley Company in 1913 could only obtain 147 horsepower at 1400 revolutions per minute from eight cylinders, five inches bore by seven inches stroke, or 18.375 horsepower per cylinder. This is the same size cylinder as used in the Liberty which now gives 450 horsepower, at 1800 revolutions, from twelve cylinders, or 37.5 horsepower per cylinder, which is double the power per cylinder obtained in the Wolseley. Even if we reduce the Liberty results to the same speed as the Wolseley, that is, 1400 revolutions, the Liberty still represents a great advance, for at that speed 350 horsepower are developed, or 29.2 horsepower per cylinder. Moreover, the Wolseley weighed 4.9 pounds per horsepower as compared with 2.3 pounds for the Liberty at the same speed, or 1400 r.p.m.



The three curves represent the average values obtained from aircraft engines, other than the Liberty, during the period from 1903 to 1917

The AIRCRAFT TRADE REVIEW

Duesenberg Making Addition to Plant

Elizabeth, N. J.—The Duesenberg Motors Corp. is planning an addition to its plant. This will be used as a motor testing department.

Detroit Valve & Fittings Dividend

Detroit, Mich.—The Detroit Valve & Fittings Co. has declared a monthly dividend of 1½ per cent on common stock, payable May 31st to stock of record May 25th.

Recent Incorporations

Albany, N.Y.—The Ideal Oil & Products Corp., of America, Manhattan, was chartered under the laws of the State of New York to make castor oil, with a capitalization of $100,000. The incorporators are J. E. St. Clair, H. L. Maynard, J. S. Evits, of 501 Fifth Avenue, N. Y.

The Overseas Equipment Co., of Manhattan, was incorporated with a capitalization of $5,000 for the manufacture of aeroplanes, boats and accessories. The incorporators are C. W. Redfield, J. Keegan, of Sedgwick Place and 67th Street, Brooklyn.

Robert Lea Talks On Gyroscopes

Cleveland, O.—At a meeting of the Cleveland Section of the Society of Automotive Engineers, Robert B. Lea, of the Sperry Gyroscope Co., gave an illustrated lecture on the adaptations of the gyroscope. Gyroscopic stabilization of aircraft and seagoing vessels and the application of the gyroscope to the compass were the principal subjects of the stereopticon and moving pictures shown.

Want Copper at 30 Cents

Washington, D. C.—Representatives of the copper industry met in Washington last week and stated that 23 cents per lb. is insufficient and asked for an increase to 30 cents per lb. for the 3 months beginning June 1. Small producers said that they would have to discontinue business unless the new price is fixed at least 30 cents.

1500 Liberty Engines Already Made

Detroit, Mich.—More than 1500 Liberty aviation engines have been produced to date, according to *Automotive Industries.* At this time four concerns are in production. Packard has produced more than 800. The Lincoln Motors completed 150 in April, and will complete 200 in May. Cadillac and Buick have both started production. Ford will be in production in 2 weeks. Packard is producing 25 engines daily at present.

Director of Oil Conservation Appointed

Baltimore, Md.—W. Chaplin Robinson, head of the William C. Robinson & Sons Company, the oldest oil house in the United States and of the Robinson Oil Corporation, has been called by the National Government to become Director of oil conservation for the United States. Mr. Robinson is winding up his business and will join the forces of the Fuel Administration.

Mr. Robinson will endeavor to save at least 10 per cent on the oil consumption throughout the country.

Personal Pars

Lieut. Charles McGhee Tyson, U.S.N.R., married Miss Betty Carson, of Highlands, N. Y. Lieut. Tyson is a naval aviator and the son of Brigadier General Tyson, of Knoxville, Tenn.

Caleb S. Bragg, automobile race driver and aeronaut, and members of the Aero Club of America, who has been stationed for some time at McCook Field, is to succeed Major Smith as director of flying at McCook Field.

Major Delos C. Emmons has been made commanding officer of the United States Aviation School at Mather Field, Sacramento, Cal.

Albert H. Hudson, formerly general purchasing agent of the Wright Martin Aircraft Corporation, New York, has assumed the duties of purchasing agent of the American International Steel Corporation, New York.

John H. Nelson has resigned from the Bureau of Standards, Washington, D. C., to become research engineer with the Wyman-Gordon Company, Worcester, Mass.

Lieut. Thomas Seymour Knap, of the Aviation Section, Signal Reserve Corps, was married on June 5th to Miss Dorothy Harding, daughter of Mr. and Mrs. G. F. Harding of Brookline, Mass.

The engagement of Miss Edith K. McCabe, of Brooklyn, to Lieut. Chas. L. Foote, Aviation Section, of Cambridge, Mass., is announced.

C. E. Bedell has been appointed superintendent of the boat-hull works of the Curtiss Aeroplane & Motors Corp., Buffalo, in the old experimental shop at Austin Street.

Secretary Baker Visits Standard

On June 6th Secretary of War Baker visited the Standard Aero Corporation's factory at Elizabeth, New Jersey, for a tour of inspection.

Some thirty executives of the factory were called into President Mingle's office to meet the Secretary, and he got a line on industrial mobilization when he found on questioning them that they were all newcomers to Elizabeth.

Moved by what he saw in one of the secret places, the Secretary told them that now he could indeed assure General Pershing that he was going to be emphatically backed up in the air. He promised the men great "doings" when their handiwork was ready for business.

Everybody else in the big works then wanted to see and hear the Secretary, so an impromptu outdoor meeting was arranged and messengers sped through the shops to summon the workers. When they had assembled Mr. Baker told them something of his experiences at the front in France and how when he arrived at an American aviation field he was welcomed by an aerial escort of 100 planes, flying in perfect formation and alignment. The sight reminded him of how important and responsible was the work of the builders of aircraft, and it had therefore greatly pleased him to observe how keen and careful all the Standard workers were.

Fiat Considering After-War Problems

Not the least difficult of the many problems to be faced at the end of the war will be provisions for workers likely to be thrown out of employment during the interval between the cessation of war contracts and the resumption of normal civilian business. This danger threatens the automobile and general engineering businesses more than any others, for the army's requirements of cars, lorries, aeroplane motors and other similar material has caused all these factories to develop considerably and has increased the number of workers in same cases several hundred per cent.

Far-seeing factory heads are already laying plans so that the increased staffs and enlarged plants may be employed to their full capacity on the production of material for which there is likely to be a demand. But there are so many factors over which business men have no control that despite all their precautions there may be a period of transformation during which it will be difficult to keep all workers fully employed.

Realizing this, the Fiat Company has already taken the initiative, in conjunction with the Motor Manufacturers' Association of Turin, of forming a special fund to relieve unemployment during the period immediately following the cessation of hostilities. This fund makes provision for the 50,000 workpeople employed in the Turin motor and metal working industries, 80 per cent of these workpeople being in the Fiat shops.

Funds will be obtained by a deduction from the workman's wages and by contributions from employers. These funds will be controlled by a joint committee of three manufacturers and three members of the trade unions. Relief will be given on a sliding scale, according to the length of time the man has been employed, and whether he is married and has children or not. Relief will be stopped on a man resuming work, or if he fails to report himself for work after a situation has been found for him. The funds can also be made use of to transfer men to another locality if by so doing they can more readily find employment.

This fund is in addition to existing out-of-owrk or benefit societies, and is intended to supplement them temporarily during an exceptional period. It is hoped in this way to attenuate, if not altogether remove, cases of hardship during the reconstruction period following the war.

London-Paris Aero Mail

Paris.—The subject of aerial postal lines from Paris to St. Nazaire and from Paris to Nice is being studied by the Postal Administration, with the eventual extension of the service to Rome and Corsica under consideration. Two aviators made an experimental postal trip from Paris to London June 6th. They used seaplanes, carrying 300 kilograms of mail matter, and the trip to London and return was made in five and one-half hours.

Secretary of War Newton D. Baker addressing the employees at the Standard Aircraft Corporation's works at Elizabeth, N. J.

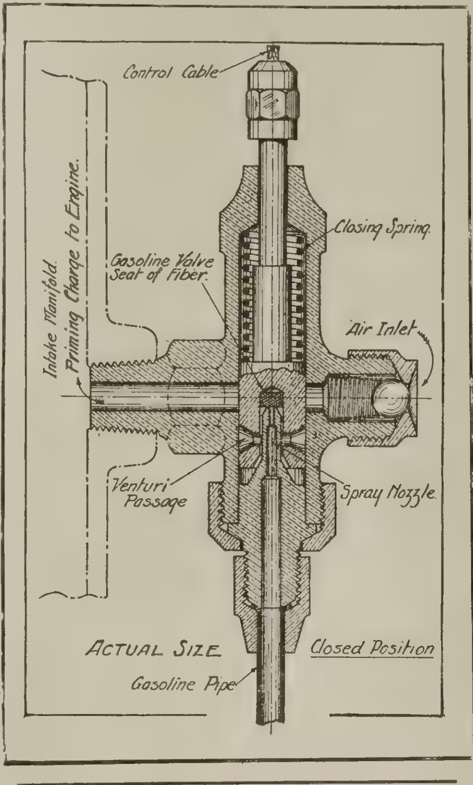
THE COPLEY PRIMER—A MINIATURE STARTING CARBURETOR

HARD starting of gasoline engines is due to the fact that the fuel now on the market has been reduced in specific gravity until the energy developed in the present day carburetor at cranking speeds is not sufficient to vaporize it. This condition is, of course, very much aggravated by cold weather. Sufficient energy must, therefore, be used to break up the fuel before a quick start may be expected. There are two ways of producing this energy. One is by using electricity for heating to vaporize the fuel and the other is by mechanical means to atomize it. The inventor of the Copley Primer has elected to use the atomizing principle, as it is by far the quicker method and may be used on all engines whether electrically cranked or not.

Referring to the blue print (cut) it will be noticed that the primer is screwed into the intake manifold above the throttle. In the primer is a plunger valve which normally remains closed and means are provided to insure it against leaking any air into the manifold when closed.

In the primer is a small air passage, 1/16" in diameter into which atmospheric air passes after leaving the ball check valve. This stream of air passes directly over and against the gasoline nozzle and thence to the intake pipe and engine. In starting, the throttle is closed practically down, that is just off the stop screw. The primer is opened and held open while the engine is cranked. It will be seen that the depression in the manifold will induce a terrific speed of air through the primer, which produces the required extra energy to atomize the heavy gasoline now being used. This has proved to be very successful and starting is effected in about three turns of the crankshaft. The weather has but little effect on the time of starting and all of the many cases of experimentation in the coldest weather seem to indicate that three turns are sufficient. We have tried all weather conditions down to 10 degrees below zero and even lower and the longest period of time required was about 15 seconds from the time the starting button was pressed until the engine was firing regularly. I say firing "regularly" with understanding of what "regularly" means in this case, for we always hold the primer open after firing begins until "regular firing" is accomplished.

We have found that engines will operate satisfactorily on this principle of priming without any aid whatever from the carburetor. It has also been found that the same size air stream and gasoline nozzle are all right for any sized engine from the Ford to the Curtiss Aeroplane Co.'s large engine. This large aviation engine has been started innumerable times on the third revolution of the crankshaft, when hand-cranked.



A word should be said regarding the use of the familiar "choker" of the carburetor. It is thought that the "choker" should accomplish this desired result, but this is erroneous, because the choker, not being located right at the jet, does not furnish the energy necessary to atomize the fuel. All the choker does, is to produce in the manifold a higher degree of vacuum and hence draw out more gasoline from the nozzle, but this gasoline must be atomized if a quick start is to be expected. It must be a finely divided mist, and not a heavy rain, and it is just this condition of finely divided mist which is accomplished by the Copley Primer.

International Aeronautical Instrument Corporation Formed

New York City.—The International Aeronautical Instrument Corporation has assumed all the assets and liabilities of the Aeronautical Department of A. Haustetter, a large optical concern of 308 Madison Avenue, New York. Mr. A. L. Haustetter is president and treasurer of the new company, and Mr. A Johns is the secretary. The company will deal in altimeters, air speed indicators, barographs and aeronautical compasses.

Gasoline Prices Fixed

Washington, D. C.—Prices of fuel oil for the Allies were fixed as follows:

F. O. B. Gulf ports—5½ cents per gallon by British Admiralty specifications. 5¼ cents per gallon by United States Navy specifications.

F. O. B. Atlantic Seaboard—7½ cents per gallon by United States Navy specifications. Prices of standard white kerosene were fixed at:

F. O. B. Gulf ports—7½ cents per gallon. Prices of standard white kerosene were fixed at:

F. O. B. Atlantic Seaboard — 8¼ cents per gallon.

Mexican reduced oil was fixed at 6 cents per gallon via Atlantic Seaboard.

These prices became effective May 20 for 60 days. The price of gasoline to the Allies was fixed yesterday by the Fuel Administration as follows:

F. O. B. Gulf ports—21 cents per gallon.

F. O. B. Atlantic Seaboard—23½ cents per gallon.

United States Navy specifications apply in both instances. Prices of aviation naphtha were fixed at the same time as follows:

F. O. B. Gulf ports—30 cents per gallon.

F. O. B. Atlantic Seaboard—32 cents per gallon.

British specifications, 302 degrees Fahrenheit final boiling point, apply in both cases.

THE BOSCH IMPULSE STARTER

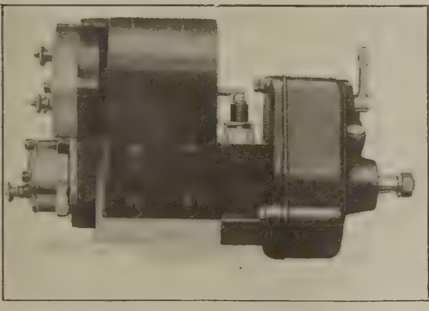
ONE of the many reasons why the magneto is so firmly established as the supreme ignition system is the fact that it does not depend upon any other unit or units for its electrical output and distribution of current.

The magneto transforms mechanical energy into electrical energy. The moment the shaft of a magneto-equipped engine revolves, the magneto begins to generate electrical energy for ignition; and, following requirements, the higher the rate of speed at which it is driven the more intense are the sparks.

To facilitate starting when necessary, the Bosch Magneto can be supplied with an Impulse Starter, which automatically "speeds up" the magneto armature at the exact moment of firing the initial gas charge or charges, thus providing at even low speeds the full electrical capacity of the magneto.

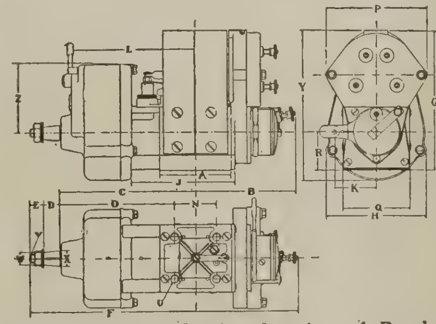
In a word, the Bosch Impulse Starter or coupling is a mechanical device for the purpose of obtaining positive and efficient starting, without the aid of batteries or a battery system of ignition.

The Impulse Starter is located between the magneto drive and the armature; when the engine is cranked or barred over, the armature is held stationary, while energy is being stored up by the compression of a series of springs. At a predetermined moment the springs are released and the armature is given a partial revolution at high speed. In this way, intense sparks are provided and the engine given its starting impulse.



The Bosch Magneto and Impulse Starter ready for service

As soon as the engine commences its regular operation, or attains a speed of about 120 r.p.m., the Impulse Starter is automatically disengaged, the "Starter" transmitting the driving energy to the magneto as a flexible coupling.



Section drawing showing location of Bosch Impulse Starter

The function of an Impulse Starter demands a strong, simple, reliable and rugged mechanism, properly balanced and of sufficiently generous dimensions to develop the power necessary for effective performance.

The design of the Bosch Impulse Starter embodies all of these details, and is therefore entirely different from anything of its kind hitherto available. It is totally enclosed in a dustproof and waterproof aluminum housing, and is integral with the magneto itself.

The operating parts are all high-grade steel, giving a high factor of safety, and built to withstand indefinitely the sudden stresses to which they are naturally subjected.

The spring action is carefully balanced, imparting an even torque to the armature, and eliminating all possible vibration. Unlike other devices of similar name, there is no added strain carried by the magneto bearings, the heavier part of the starter being carried on its own sleeve bearing.

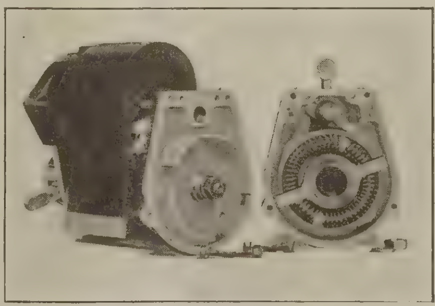
The control of the "Starter" is by means of a lever mounted on a shaft porjecting from the front of the housing. The lever is so constructed that it can either be operated by hand or through the medium of a control connection. The proper movements for the lever are indirated by arrows on the name plate.

The "Starter" is so constructed that should it accidentally be put into engagement while the engine is running, it will not actually go into operation, consequently no damage will be done to the "Starter" or to the magneto.

No attention whatsoever is required, with the exception of a few drops of oil every four or five weeks in the one oil cup with which it is fitted. This communicates with an automatically acting oil reservoir, and provides for all the lubrication that is necessary.

The Bosch Impulse Starter is designed primarily for truck and tractor service in conjunction with types DU4 and ZR4 Independent Bosch Magnetos for four-cylinder engines, but can be supplied also, on special orders, in conjunction with any standard types of Bosch magnetos for marine engines, automobiles, aeroplanes, stationary engines, or for any other ignition service. The Impulse Starter is not an attachment, but is provided only as a part of new Bosch magnetos. Size and dimensions can be ascertained from the accompanying dimension drawings.

Prices will gladly be quoted upon receipt of request, stating size and type of engine.



Showing location of Impulse Starter

ADVANCE ROT AND LATENT DEFECTS IN AEROPLANE TIMBER

By **J. S. BOYCE, B.Sc., M.F., Ph.D.**

Assistant Pathologist, United States Department of Agriculture, Bureau of Plant Industry.

THE present world war has exemplified in a striking manner the close, and hitherto unsuspected, relation of many branches of business and science to the successful maintenance of the military establishment. The lumber industry especially has been called upon to put forth its maximum effort as an aid in winning the conflict, not only in order to furnish manufactured lumber of all classes for the direct use of our armed forces, but also to aid in many ways indirectly.

But the most exacting demand which the lumber industry has to meet is to supply raw material for aircraft production. The lumber mills of the Pacific Coast particularly have been called upon to furnish enormous quantities of lumber for this purpose. Only the highest grade product of certain tree species can be utilized. While normal wood of Sitka spruce (*Picea sitchensis*) is undoubtedly the best, that of Douglas fir[1] (*Pseudotsuga taxifolia*), sugar pine (*Pinus lambertiana*), western white pine (*Pinus monticola*), western yellow pine (*Pinus ponderosa*) and other species are utilized to a large extent. Hardwoods are used for certain purposes but the far greater number and most vital members incorporated in an aeroplane are of coniferous wood. When these parts are finally certified as suitable for use they must absolutely free from defect or abnormality of any kind whatsoever, and this calls for the most rigid and careful technical inspection by thoroughly experienced men.

One of the commonest defects its decay, (rot, punk, or as it is sometimes called, "dote"). Decay is caused by the action of wood destroying fungi. A fungus is a very simple plant, made up of microscopically fine threads (hyphae), invisible to the naked eye except when they occur in masses, as is sometimes seen in badly decayed wood. These hyphae use certain constituents of the cell-walls of the wood for food, neglecting others, with the result that the cell-walls are broken down, the wood thus being greatly weakened and more or less destroyed, just as the roots of green plants extract definite constituents from the soil to the point of exhausting it, while in appearance the soil does not seem to be changed in spite of the profound alterations in its physical and chemical qualities. It is the breaking down of the wood and the change in its physical and chemical qualities that we call decay or dote. The degree of decay is determined by the energy of growth of the fungus, the length of time the fungus has been at work, and the type of wood the fungus inhabits.

For the purposes of our discussion two types of wood destroying fungi may be recognized, those mainly attacking the heartwood of standing, living trees and those principally confining their activities to the manufactured product, such as sawed lumber, cross ties, poles, etc. The former rarely continue their work of destruction after the tree has been cut down and worked up into lumber, except under very favorable conditions. The latter, which will be discussed later, are not parasitic, that is, they are unable to attack living trees.

Nearly every known tree species from the temperate zone north is more or less subject to this type of defect and our Pacific Coast conifers are no exception to the rule. Douglas fir is particularly susceptible to attack by the ring scale fungus (*Trametes pini*)[1], sometimes as high as fifty per cent of the merchantable timber in a given stand being destroyed by this organism. The resulting decay, often termed red rot, is easily recognized by the fact that the reddish heartwood of the tree is honey-combed with small white pits in which the substance of the cell walls of the wood is reduced to cellulose. Douglas fir is also subject to attack by the chalky quinine fungus, *Fomes laricis*, the sulfur fungus, *Polyporus sulfereus*, a butt rot causing fungus (Schweinitz' toadstool), *Polyporus schweinitzii* and *Fomes roseus*. The same above fungi, with the possible exception of *Polyporus sulfureus* and *Fomes roseus*, destroy the heartwood of most of our pine trees, to which a number of other fungi are to be added.

The theory that Sitka spruce is free from decay is absolutely untenable. The fact is that this species, until the present unparalleled demand arose for aeroplane material, had been of slight economic importance, thus receiving little consideration or study. There are, to the knowledge of the writer, no accurate figures available on the amount of defect due to decay in Sitka spruce, but the San Francisco collection of the Office of Forest Pathology records three different heartwood destroying fungi on this tree, viz., the red belt Fomes (*Fomes pinicola*), Schweinitz' toadstool (*Polyporus Schweinitzii*) and the sufur fungus (*Polyporus sulfureus*), and a destroyer of dead timber *Aurantiporus* sp. Reasoning by analogy we may expect to find several other decays besides the above, for Schrenk (4, pp. 19, 24, 31, 40, 45, 49) reports six wood destroying fungi occurring on red spruce (*Picea rubens*) and white spruce (*Picea canadensis*) in New England, all of which are known to attack other species on the Pacific Coast. Chief among these is the very destructive ring scale fungus (*Trametes pini*). In Europe, Tubeuf and Smith (6 pp. 440, 449, 450, 453) report four wood destroying fungi on spruce, and again the ring scale fungus is included.

Typical decay or rot (dote), is easily recognized. Here the continued activity of the fungus has produced such profound alterations in the wood that even the untrained eye cannot fail to notice them. Advancing from this focus of energetic destruction the fungus hyphæ grow into hitherto sound wood and there begin gradually to break down the structure of the cell-walls, so that beyond the typical decay we find a zone in which the hyphæ ramifying through the wood cells, become less numerous as the distance increases from the area of typical decay until finally they end entirely, quite analogous to the way the roots of a tree spread out in the soil in order to obtain their food supply, becoming smaller and smaller as the distance from the root collar increases.

The distance to which the fungus hyphæ travel in advance of the main body, in other words, the extent of advance rot beyond the typical decay depends very largely not only upon the type of fungus, but also upon the type of wood attacked. In general it may be said that with growing resin content of the wood the advance of the hyphæ becomes slower so that in woods free from resin like fir, or poor in resin like spruce, the advance will be most rapid, in woods containing more resin like Douglas fir less rapid, and in the resinous pine woods even more retarded. In this zone of advance rot the destruction of the wood cells is well under way but visible indications of their condition are in general little understood or recognized. It has been only in the past few years that any exact studies have been made along this line. Meinecke (2, pp. 28 and 51 and 3, p. 33) found in the case of white fir (*Abies concolor*) attacked by the Indian paint fungus (*Echinodontium tinctorium*) causing the stringy brown rot, that the advance rot appeared in longitudinal sections as small light-brownish spots and discolorations intermingled with horizontal burrows. A careful examination was necessary to detect these symptoms. This advance rot invariably went through the mill, reached the yard, and on drying out became brittle and dropped to pieces. Loss of this kind is so common in the yard that it has resulted in a distinct prejudice on the part of the lumberman against this species. The advance rot can be entirely eliminated by proper and more judicious bucking in the woods.

What results in appreciable loss in the case cited where the lumber is used mainly for structural purposes, becomes disastrous in aeroplane construction where the timber is put to the most exacting tests. As long as it is impossible to have every single tree carefully examined immediately after it is felled, no lumber coming from a tree containing decay should be allowed to be accepted. The temptation undoubtedly is great to buck off the decayed part and let the apparently sound portion of the bole go to the mill. It is just this apparently sound part that contains advance rot. In an aeroplane certain members such as wing, beam and struts, all designed to eliminate weight as much as possible are subjected to an extraordinarily severe strain. Therefore, every piece of wood on which this strain falls must be absolutely perfect and of the highest possible strength. To permit any wood with advance rot to enter into the framework of an aeroplane endangers a valuable machine, and, which is far more important, the life of a highly trained man.

The same conditions as in typical advance rot where the latent decay extends beyond the typical decay, prevail in the case of incipient fungous activity. During the first stages of infection of the tree by the fungus the hyphæ act quite similarly to those in advance rot. The young fungous plant, once it becomes established in the heartwood of the tree, spreads through the wood and begins to break down the cell walls by using certain constituents for food. With the growth of the fungous plant its activity becomes more and more destructive until finally a stage is reached which we call decay.

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[1] Commonly sold under the trade name of Oregon pine. Good descriptions and illustrations of most of the fungi mentioned in this paper can be found in a Manual published by the U. S. Department of Agriculture, Forest Service, entitled "Forest Tree Diseases Common in California and Nevada," by E. P. Meinecke.

Unfortunately from our point of view advance rots as a rule do not show up in the yard as in the example cited, and it is in the detection of these latent rots that serious difficulty is encountered. The alterations are often so faint that it requires special training and experience to recognize them. The advance rot in Douglas fir caused by the ring scale fungus, appears as a reddish purple discoloration in the reddish heartwood, often so faint as to be almost unrecognizable except when viewed by a trained eye in the proper light. Hence, material with this defect easily finds its way into the yard where it does not fall to pieces on drying, as in the case cited above, but remains apparently firm in spite of its lessened strength. Of course, it is not so serious when planks or timbers containing this advance rot are used for the usual building or construction purposes, since it is rarely that the maximum strain would be put on them, but it is self-evident that none of this class of material should be permitted to form any portion of the structural framework of an aeroplane.

The advance rot caused by *Fomes roseus* in Douglas fir appears as an inky green discoloration varying from deep to very faint. This is not of so much importance from our viewpoint since the infection nearly always occurs in the upper part of the bole. The chalky quinine fungus produces a reddish advance rot somewhat tinged with purple, often very difficult to distinguish from that caused by the ring scale fungus. The latter, however, is the most important of all, occurring, as it does, so commonly and over so wide a range.

The reader must not get the impression that all color variations from the normal in lumber are indications of advance rots caused by wood destroying fungi. To the contrary—and it is here that an opinion on a definite case must be based on training and experience. For example, heartwood of Douglas fir may be of a somewhat yellowish brown tint instead of the normal red. This does not indicate defect. Wood of this type is just as strong and, as a rule, more easily worked than the usual kind. The cause of this variation in color in unknown, but trees with yellowish wood are most commonly found in the coast belt indicating that conditions of growth may be the unlying factor. Then too, the reddish color of the heartwod assumes different shades in different individuals.

Again in the heartwood of incense cedar (*Libocedrus decurrens*) a very pronounced purplish color is often seen, particularly striking in cross section. While this is often found in trees attacked by the dry-rot fungus (*Polyporus amarus*), it is not the advance rot caused by this organism—in fact, it is not a defect but frequently occurs in normal trees.

Wood around wounds, either open or healed over, invariably presents a color deviation from the normal. Such wood usually has a grayish to brownish shade and a "dead" appearance, difficult to describe but readily recognizable to the experienced eye.

While the variations in color just discussed occur in the wood of standing living trees, the wood is also subject to certain natural changes in color during the seasoning process after it has been worked into lumber. Furthermore, as seasoning progresses advance rots become much more difficult to recognize, the color becomes much less discernible, even disappearing almost entirely. The rough surface of sawed lumber adds very materially to the difficulty of inspection. But more important still, is the fact that almost all coniferous lumber, under certain conditions, is subject to attack by the so-called wood staining or wood discoloring fungi. These fungi strongly stain the sapwood, causing a blueing, blackening or reddening according to the organism at work (sap stain). The hyphæ do not attack the substances forming the cell walls of the wood but obtain their nourishment from materials in the wood cells, rarely boring through the wall in order to pass from cell to cell, but usually availing themselves of natural passages always existing between cells in normal wood. Therefore, the lumber, while rendered unsightly is not necessarily weakened. Relative strength tests for stained and unstained material are not in existence for Douglas fir or Sitka spruce, but no difference was found in the case of western yellow pine (5, p. 14) or short-leaved and long-leaved pine of the south (8, p. 17). Sitka spruce is quite susceptible to attack by these wood staining fungi. Again it is hard to distinguish this type of discoloration from certain advance rots, that caused by *Fomes roseus* for example. This difficulty is enhanced in woods such as spruce where it is often hard to distinguish sapwood from heartwood.

Cases will arise where it is impossible to say from an examination with a hand lens whether a discoloration is advance rot or some harmless color variation. Then the final decision must be based on a careful examination with the compound microscope. It would be impossible to reject on principle all wood showing color variations, on account of the excessive loss both in actual cost, and in the time of skilled workmen.

There can be no question of the principle that wood containing advance rot must not be incorporated into the framework of an aeroplane, and it has been pointed out before that under present conditions only the most rigid, expert inspection will prevent this. But such material should never be allowed to leave the woods. Inspection for advance rots should begin when the trees are cut. For example, when a practically completed wing beam is rejected at the factory, as is often the case the loss is very great in dollars and cents. To this should be added the irreparable loss of time required for seasoning the lumber, of space on our overtaxed rolling stock, and of labor and time of skilled workmen, all of which might have been devoted to sound useable material. If the unsound material had been left in the woods in the raw state the only loss would have been the relatively insignificant cost of felling and bucking the tree. Much of this material can be utilized for other purposes.

Aside from these decays with their advance rots in the heartwood of standing living trees, there is another class of decays which might well be briefly considered here. Certain fungi confine their activities mainly to lumber and timbers. Two very common and widespread forms on the Pacific Coast are *Merulius lacrymans* causing the dry-rot of buildings and *Lenzites sepiaria,* frequently found on rotten cross ties. These two fungi are particularly destructive to coniferous wood. The presence of such decays may usually be traced to improper storage conditions, chief among which is poor methods of piling. Lumber should be piled so that the pieces are well aerated and raised above the ground. It is beyond the scope of this paper to deal in detail with this. For complete and specific information the reader may refer to Humphrey's recent publication (1).

There is one point worth consideration from our viewpoint, however. It has been found in the past that shipments of seasoned Douglas fir stock to South Africa, apparently sound when leaving this coast, sometimes reached their destination with more or less defect due to decay. What really happened is this. Spores, (microscopically small and light reproductive bodies corresponding to seeds in higher plants) of these lumber destroying fungi are found everywhere around lumber mills or docks. The lumber, when loaded, bore many of these spores. When tropical seas were reached, the close hold of the vessel acted as a forcing chamber, the spores germinated (sprouted) and the resulting hyphæ found climatic conditions ideal for their development, causing considerable decay in the lumber in a relatively short time. This is exactly the danger to which shipments of aeroplane timber from Pacific Coast ports to Europe, routed through the Panama Canal, are exposed, especially when the stock comes directly from the mill to the dock without any seasoning or artificial drying as is now often the case. That spruce wood is very susceptible to attack by the dry rot fungus is well known. Indirect reports indicate that loss has occurred in this way. Furthermore, stock so handled must inevitably become completely sap stained. Where transportation facilities and cost make it possible it would be far preferable to ship material of high relative value by rail to an Atlantic port, thus permitting a certain amount of seasoning en route and entirely eliminating the combination of close packing in the hold of a vessel and the moist heat of a tropical climate.

Attention should here also be called to another serious source of weakness in spruce timber, although not caused by fungi. Wood is composed of small elongated cells with more or less thickened cell walls. In dry wood the interior of the cells is filled with air: Consequently the relative strength depends altogether on the mass of cell-wall material per unit of measure. The more cell walls the unit contains and the thicker the cell wall, the stronger the wood. In certain spruce trees the wood cells are unusually large, in other words, there are fewer cell walls and more air spaces per unit. Besides, the cell walls are often much thinner than usual, thus reducing very considerably the ratio of wood material to air. That wood of this type, although in itself sound, is much inferior in strength to normal wood, is self-evident. Failures have already been traced to this abnormal condition. The cause of this peculiarity of growth is not known. The trained eye will easily detect this source of weakness by careful examination of the wood in cross-section with the hand lens. It is self-understood that wood of this type should be rejected for aeroplane construction.

No attempt can be made here to discuss all the defects which an inspector must be prepared to recognize. Pitch pockets, seams, shakes, knots and other plain defects are too well known to deserve specific description. This paper merely calls attention in a very brief manner to the waste involved in permitting

(*Continued on page* 691)

INTERNATIONAL AIRCRAFT STANDARDS

Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications, which supplement those already published in Aerial Age.

SPECIFICATIONS FOR MAHOGANY LUMBER FOR USE IN PROPELLER CONSTRUCTION 2 W 3 April, 1918

General.—1. (*a*) The General Specifications, 1G1, shall form, according to their applicability, a part of these specifications.

(*b*) This specification is drawn to govern the quality of mahogany lumber supplied for the construction of propellers.

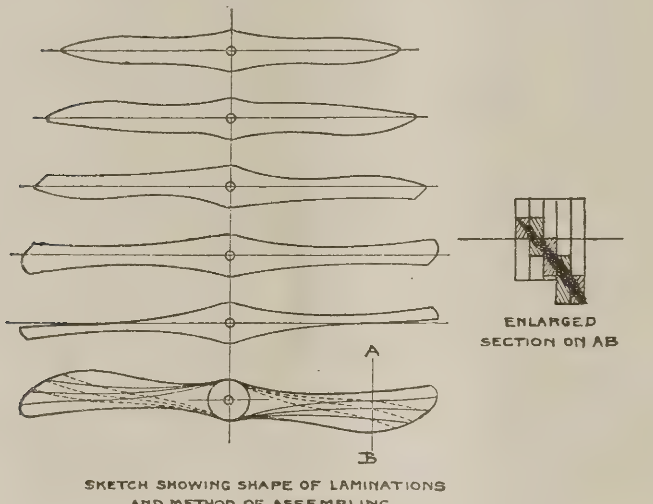
ENLARGED
SECTION ON AB
A
B
SKETCH SHOWING SHAPE OF LAMINATIONS
AND METHOD OF ASSEMBLING.

Fig. 1.—Propeller made of five laminations.

(*c*) Only true mahogany (*Swietenia mahogani*) or such substitutes as are expressely approved may be supplied.[1]

Grade.—2. (*a*) Each board supplied shall yield one or more laminations free from defects (see Fig 1), and the waste on each board shall not exceed one-third of the surface measure of the piece.

(*b*) Shipments on this specification must contain all lumber of better grade that has been produced in cutting the logs at the mill. No portion of higher grade material shall be sorted out and retained by the mill.

Grain.—3. All boards shall be reasonably straight grained and suitable for propeller purposes. Quarter-sawed lumber is preferred.

Texture.—4. Boards containing brashy, doty, or punky wood will not be accepted.

Dimensions.—5. (*a*) Unless otherwise specified in the order, dimensions shall be as follows:

(1) *Thickness.*—Rough, green lumber must be full 1 inch thick.

(2) *Width.*—No board shall be less than 8 inches wide and not more than 10 per cent of the resulting laminations shall be less than 9 inches wide nor more than 25 per cent less than 10 inches wide.

(3) *Length.*—No board shall be less than 8 feet long and at least 80 per cent of the resulting laminations must be 9 feet long or over.

(*b*) The widths most desired are 10 to 14 inches with the greatest percentage between 12 and 14 inches.

(*c*) Lengths and widths shall be measured according to National hardwood rules.[2]

Shipment.—6. Rail shipments shall be made in closed cars, protected from the weather. The lumber must be carefully piled to avoid damage in transit.

Inspection.—7. (*a*) The inspector shall have free access to all parts of the mills where this lumber is being manufactured, and shall be afforded every facility to satisfy himself that the lumber conforms to this specification.

(*b*) This specification shall be subject to construction and interpretation by the inspection department of the purchaser.

References: United States Signal Corps Specifications No. 15028-A.

SPECIFICATIONS FOR CAST IRON 3S 36 April, 1918

General.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

Use.—2. This material is suitable for piston rings, cylinder liners, valve guide bushings, etc.

Material.—3. The following limits of chemical composition are desirable:

	Per cent.
Total carbon, minimum	2.8
Combined carbon, maximum	.75
Manganese, maximum	.75
Phosphorus, maximum	1.00
Sulphur, maximum	.12
Silicon, maximum	2.25

Workmanship and Finish.—4. The metal shall be close grained and uniform in quality. The castings shall be free from cracks, flaws, blowholes, hard spots, spongy spots, excessive shrinkage, and other defects. They shall be well cleaned of gates, risers, and fins, and shall have a smooth surface. Castings must be soft enough to machine readily on all sections. A casting may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected castings shall be returned to the manufacturer at his expense. This clause shall not apply to castings fabricated after export.

Physical Properties and Tests.—5. *Springing Test.*—(*a*) The manufacturer must subject each piston ring to the following springing test. Only rings which withstand this test may be submitted to the inspector. The ring shall be pressed over a cone until the distance between the ends of the ring is equal to seven and one-half times the mean thickness of the ring. Upon removal from the cone the ring must show no set.

Transverse Test.—(*b*) The test bar supported on knife-edges 12 inches (304.8 mm.) apart and loaded centrally by means of a knife-edge shall show the following properties:

Breaking strength, minimum....................400 pounds (181.8 kg.)
Deflection under load of 350 pounds (159.1 kg.), minimum, 0.15 inch (3.81 mm.)

Hardness Test.—(*c*). The test bars shall have the following hardness:

Brinell hardness number	200 to 240
Shore scleroscope hardness number	33 to 40

Hardness tests may also be made on castings selected at random and must conform to the requirements specified.

Selection of Test Specimens.—6. (*a*) At least 25 per cent of the piston rings submitted at any one time shall be subjected to springing test.

(b) For all castings other than piston rings test bars shall be cast of the same metal and under the same conditions as the castings they represent. The test bars shall be 0.5 inch (12.7 mm.) square and 14 inches (355.6 mm.) long, and shall have identification marks such as a serial number and date cast on them. One test bar shall be required for each lot of 250 castings or less.

(*c*) Samples for chemical analysis shall be taken from the test bars, but may also be taken from any casting chosen at random. In the case of piston rings the samples shall be taken from the rings.

Dimensions and Tolerances.—7. The castings must conform to the drawings, and surfaces which are to be machined shall admit of finishing to the required dimensions without leaving evidence of the cast surface.

Packing, Shipping, and Delivery.—8. (*a*) The melt number or date of casting shall be cast on each casting.

(*b*) Castings shall be packed in boxes in such manner as to insure against breakage or injury to finished surfaces.

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[1] African mahonany (*Khayasenegalensis mahogoni*) is approved by the United States Signal Corps.

[2] National Hardwood Lumber Association rules, August, 1917, page 10, "Measurement." "In the measurement of lumber of random widths, fractions of over one-half foot, as shown on the board rule, must be counted up to the next higher figure; fractions of exactly one-half foot and less, as shown on the board rule, must be counted back to the next lower figure. Tapering lumber in standard lengths must be measured one-third the length of the piece from the narrow end."

AEROPLANE MECHANICS COURSE AT CITY COLLEGE

The College of the City of New York will shortly inaugurate a course in aeroplane mechanics, which will be under the supervision of Professor D. B. Steinman, C.E., Ph.D., Member, American Society of Civil Engineers; Member, Aerial League of America.

An informational course designed to answer the large and growing demand for draughtsmen, designers, and constructors in aeroplane factories and for pilots, observers and mechanics at the front.

The lectures cover the elements of the theory of flight and a descriptive study of aeroplanes, their design, construction and operation. The basic principles will be made clear by stereopticon views, photographs and models.

I. Introduction—Types of aeroplanes—The controls—Tractor and pusher biplanes—Monoplanes — Aeroboats — Nacelles and fuselages—Empennages.
Review of elementary principles of mechanics and physics necessary for the study of aeroplanes—The gyroscope and its applications—Properties of the atmosphere—Automative stabilizers—Indicating instruments used in flight.

II. Theory of Flight — Air resistance — Streamline shapes — Inclined surfaces — Cambered surfaces—Lift and drift—Lilienthal's tangential—Aspect ratio—Centers of pressure—Elements of aerodynamic theory.

III. Aeroplane Wings — Characteristics of aerofoils—Suction on top face—Camber of upper and lower faces—Streamlining—Reserve curvature—Warping of aerofoils—Ailerons—Modification of shape—Characteristics of typical sections—Biplane effect—Staggering of planes—Dihedral and retreat—The tail planes.

IV. Characteristics of the Aeroplane—Angle of incidence—Decalage—Wash-out—Tail interference—Lifting capacity—Structural resistance—Drift—Power required at various speeds—Power available from the propeller—Gliding or volplaning—Climbing rate—Construction and use of characteristic curves—Lift and drift chart—Resistance chart—Power chart—Propeller chart—Engine chart—Fuel consumption and radius of action.

V. Design of Aeroplanes—Stresses in the wings and bracing—Spars and wires—Safety factors—Crystallization and fatigue—Detail of construction—Steel and other metals—Aeroplane woods—Wing covering—Assembly and adjustment.

VI. Aeroplane Motors—Internal combustion engines—Operating principles of two and four stroke engines — Efficiency — Engine parts and functions—Liquid fuels—Carbu-

(*Continued on page 695*)

THE FRIEDRICHSHAFEN BOMBING BIPLANE

A Report Issued by the Technical Department of the Department of Aircraft Production, Ministry of Munitions

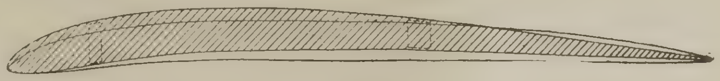


Fig. 10.

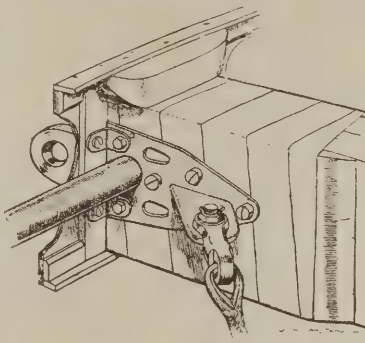


Fig. 9.

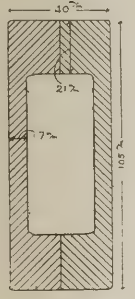


Fig. 11.

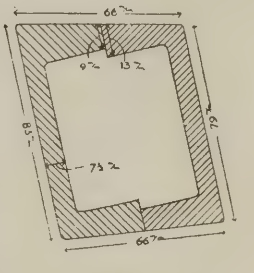


Fig. 12.

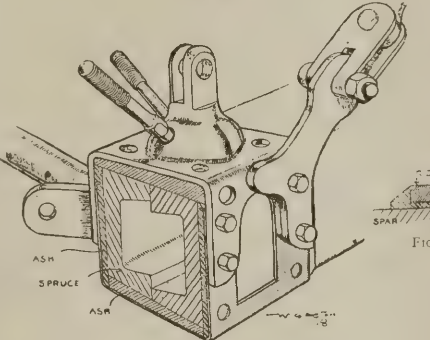


Fig. 14

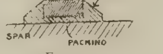


Fig. 13

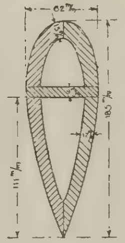


Fig. 15.

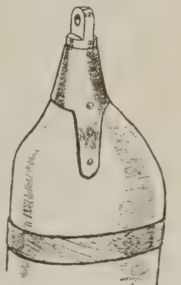


Fig. 16.

(*Continued from page* 632)

Oil Pump

The main supply of oil is carried in sumps forming part of the base chamber. A secondary supply of oil, from which a small fresh charge is drawn at every stroke of the oil pump, is contained in a cylindrical tank supported by brackets from the engine struts, and placed immediately behind the radiator. This tank has a capacity of 25 litres = 5½ gallons. Each tank is furnished with a glass level, which is visible from the pilot's seat.

Petrol Tanks

The two main tanks which are placed, one under the pilot's seat and the other at the top rear end of the nacelle, contain 270 litres = 59½ gallons each, and are made of brass. Each is provided with a Maximall level indicator, which employs the principle of a float operating a dial by means of a cable enclosed in a system of pipes.

A hand pump is fitted conveniently to the pilot, and pressure is normally provided by the pumps installed in each engine. An auxiliary tank, holding approximately 13 gallons, is concealed in the upper main plane, not immediately over the nacelle but a little to the left side. This auxiliary tank is fitted with a level, as shown in Fig. 29, which is visible from the cockpit. The auxiliary tank appears to be used only for starting purposes. It is covered with a sheet of fabric held in position by "patent fasteners."

Engine Controls

Running from each engine to the nacelle is a horizontal streamline casing, containing the various engine controls. A section showing the arrangement of these inside the fairing is given in the sketch, Fig. 30. The leading edge of the streamline casing consists of a steel tube, to which are welded narrow steel strip brackets, to the rear end of which are bolted thinner strips which are hinged in front to the tube. The whole is then enclosed in a sheet aluminum fairing.

Through the leading tube passes the throttle control rod for each engine, the two throttles being worked either together or independently by the ratchet levers, shown in Fig. 31. These are mounted on a shelf convenient to the pilot's left hand. This control requires a considerable number of bell cranks and countershafts, but was noticeably free from backlash. The throttle is opened by the pilot pulling the levers towards him.

On the dashboard are two revolution counters and two air pressure indicators. The metal parts of these dials are painted red for the left engine and green for the right, and the same coloring applies to the magneto switches, one of which contains a master switch which applies to both magnetos on both engines.

Piping

The various systems of piping are distinguished by being painted different colors, thus the petrol pipes are white, arrows being also painted on them to show the direction of flow; air pressure pipes are blue, and pipes for cable controls grey.

Propeller

The propellers are made by the Luckenwalde Propellerwerke, Niendorf. Each propeller is 3.08 metres in diameter and is made of nine laminations, which are alternately walnut and ash, except one which appears to be of maple. The propeller has the last 20 ins. of its blade edged with brass. The pitch is approximately 1.8 metres and the maximum width of the blade 220 millimetres.

Controls

Only one set of control gears is fitted, but as pointed out, the seating accommodation is so arranged that any of the crew can take charge if, and when, necessary.

The elevator and aileron control is shown in sketch Fig. 32. It consists of a tubular steel pillar mounted on a cranked cross bar at its foot. The ailerons are worked by cables passing over a drum on the wheel, whence they descend through fibre quides on the cross bar to another wheel mounted on a countershaft below, from which they are taken along inside the leading edge of the lower wing and finally over pulleys up to the aileron levers on the top plane. The latter are partially concealed in slots let into the trailing edge of the wing. The upper and lower ailerons are connected by means of pin jointed tubular steel struts of streamline section.

It will be observed from Fig. 32 that a locking device whereby the elevator control can be fixed in any desired position is fitted, and consists of a slotted link which can be clamped by a butterfly nut to the control lever. This link is hinged to a small bracket attached to the panel below the pilot's seat.

Fig. 33 shows the rudder control, from which cables are taken over pulleys and through housings in the nacelle and finally to the end of the fuselage. The cranked rudder bar is of light steel tube and is arranged to be placed in the pivot box in either of two positions. It is furnished with light steel tubular hoops which act as heel rests and are adjustable. A locking clip is fitted on the floor of the cockpit so that the rudder can be fixed in its neutral position.

A novel type of trimming gear is an interesting item of the control. Movement of the elevator control from the normal upright position of the stick is made against the tension of one of two springs which can be alternately extended and relaxed by means of a winch connected to them, as shown in the diagram, Fig. 34. Normally these springs tend to bring the control stick back to a central position, in which the elevator lies flat, but if one of the springs is tensioned by winding up the winch in clockwise direction, the position to which the stick will tend to come when released will be such as to set the elevator at a positive angle. This winch gear, which is illustrated in Fig. 35, is mounted on the right-hand side of the nacelle, and is therefore under the command of the pilot's companion.

The crank is furnished with a locking pawl, which engages with a ring of small holes bored in the plate of the winch. The steel springs used in conjunction with this apparatus are some 3 ft. long and about ¾ in. in diameter. The inscription behind the winch read:—

Nose heavy—Right wind.
Tail heavy—Left wind.

Landing Gear

As might be expected, the landing gear on this machine is of massive proportions. Two vertical streamline section wood-filled tubes descend from the centre section wing spars, immediately under the engine, to a bridge piece or hollow girder made of welded steel. Through an oval hole in this girder a short axle carries two 965 mms. × 150 mms. wheels (38 in. × 6 in.). These work up and down against the tension of a bundle of steel springs about ½ in. in diameter and made of wire approximately 1-16 in. thick.

The steel girder is extensively pierced for lightness, and the edges of the holes are swaged inwards. The axle is prevented from moving sideways by plates, and is provided with short steel cables which act as radius rods and connect it to the front of the girder. The whole of the box girder is covered in with a detachable bag of fabric, which extends up to the small cross bar mounted immediately above the girder.

Mudguards are provided behind each landing wheel for the purpose of preventing any mud or stones dislodged by the wheels from coming in contact with the propellers.

From the front and rear of the box girder streamline tubes are taken to the ends of the main wing spars, where they abut against the nacelle, and these diagonals are further braced with streamline steel tubes. Both the vertical

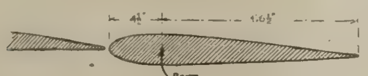
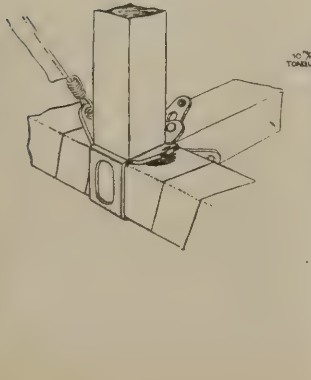
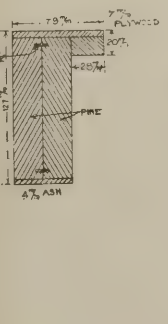


Fig. 17.





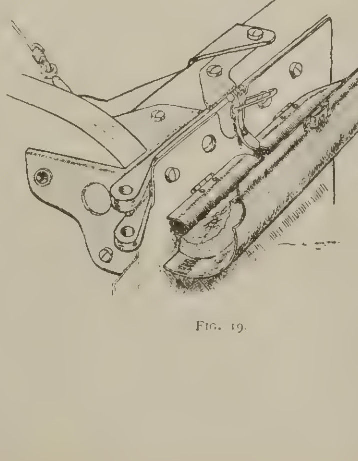


Fig. 19.

and diagonal tubes are held in split sockets so as to be easily replaceable if damaged.

In addition to the four main landing wheels, a fifth is mounted under the nose of the fuselage. This wheel is 760 mms. × 100 mms. (30 in. × 4 in.). It is mounted on a short axle, which is capable of sliding up and down slots in its forks against a strong coil spring, and it is also capable of a certain amount of lateral movement along its axle, also against the action of two small coil springs.

The tail portion of the fuselage is protected by a fixed skid made of wood but shod with a steel sole. This is fitted with a small coil spring contained inside the fuselage.

Wiring

The whole of the wiring system on the machine is very neatly carried out. There are three main systems; firstly, the ignition wiring, which is contained for the most part in tubes of glazed and woven fabric; secondly, the heating system, for which the wires are carried in flexible metal conduits; and, thirdly, the lighting system, in which a thin celluloid protective tubing is used. Wires are run from the nacelle along the leading edge of the upper planes to points level with the outermost strut. Here they terminate in a plug fitting placed behind a hinged panel. Apparently lamps are intended to be served by this circuit. Immediately in front of the pilot's seat a universally jointed lamp bracket is mounted on the outside of the nacelle. The exact purpose of this lamp is not known, as it could not illuminate any instruments.

Armament

Both the forward and rear cockpits are furnished with swivel gun mounts carrying Parabellum machine guns. These mounts consist of built-up laminated wood turntables working on small rollers, and carry a U-shaped tubular arm for elevation. This arm is hinged to a plunger rod working through a cross head, and arranged so that the arm is normally pulled down flat on the turntable by a coil spring. The plunger can be locked in any of a series of positions by means of a bolt operated by a hand-lever through a Bowden wire. A second lever allows the turntable to be locked at any desired point. A perforated sheet-metal shield protects the cross head and spring. Small shoulder pads are fixed on the turntables, of which that in the forward cockpit has a diameter of 2 ft. 10½ in., whilst in the rear the diameter is 3 ft. ½ in.

The after-gunner is prevented from damaging the propellers by two wire netting screens, supported by tubular steel brackets, placed on either side of his cockpit. These are sketched in Fig. 36.

In addition to these two guns, provision is made for mounting a third in front of, and to the right of, the pilot's cockpit, where it could be managed by his companion. For this purpose a clip is provided immediately under the coaming of the nacelle, and the handle of this protrudes through a slot in the dashboard. The clip works on the eccentric principle, and appears to be self-locking. Its construction is shown in detail in Fig. 37.

A rack for Verey lights is mounted on the outside of the nacelle convenient to the pilot's companion.

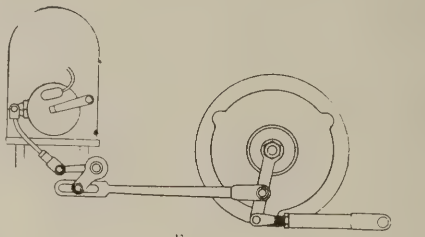


Fig. 24.

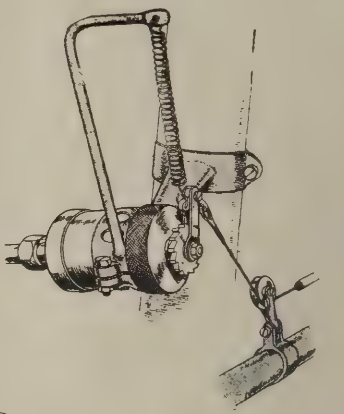


Fig. 25.

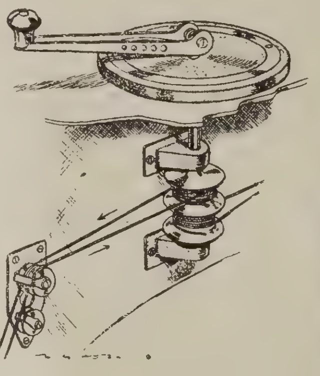


Fig. 26.

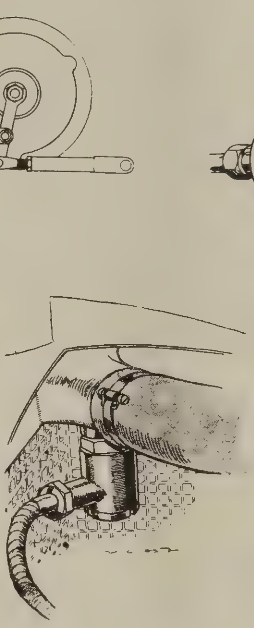


Fig. 27.

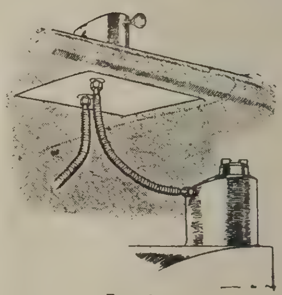


Fig. 28.

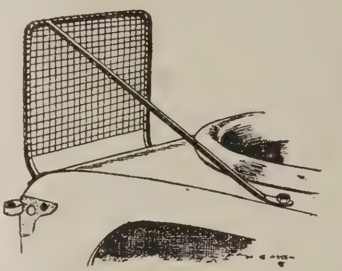


Fig. 36.

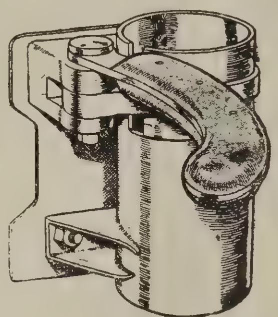


Fig. 37.

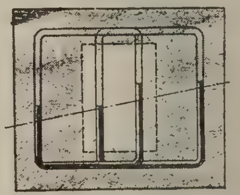


Fig. 38.

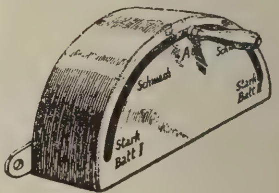


Fig. 39.

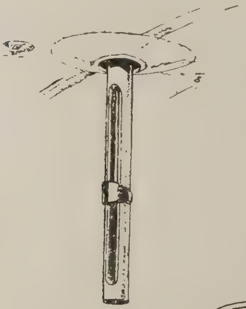


Fig. 29

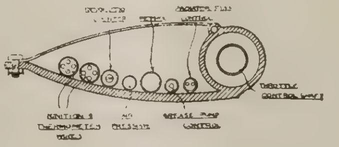


Fig. 30

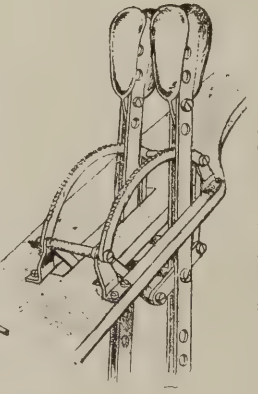


Fig. 31

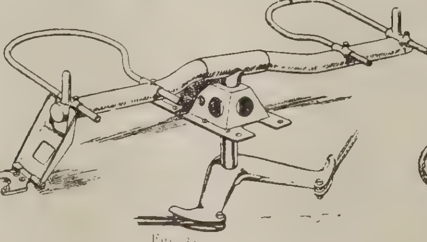


Fig. 33

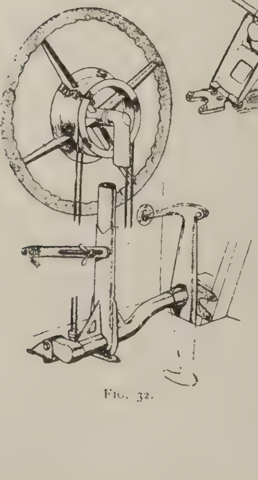


Fig. 32.

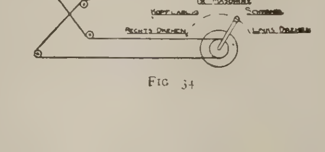


Fig 34

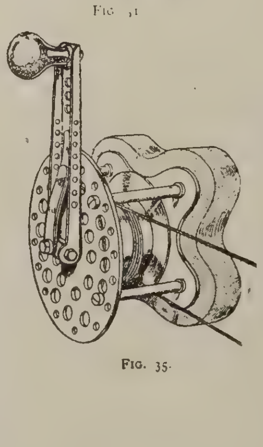


Fig. 35.

INSTRUMENTS

Airspeed Indicator

Considerable interest attaches to the fact that this Friedrichshafen Bomber is the first enemy machine brought down which has been found provided with an airspeed indicator. This is of the static type, embodying a Pitot head of the usual type. The indicator has a dial of large size, and is altogether a much more bulky instrument than any for a similar purpose used in British machines. An investigation of its mechanism is being made.

Altimeter

This is of the usual type, reading to 8 kilometres.

Level Indicator

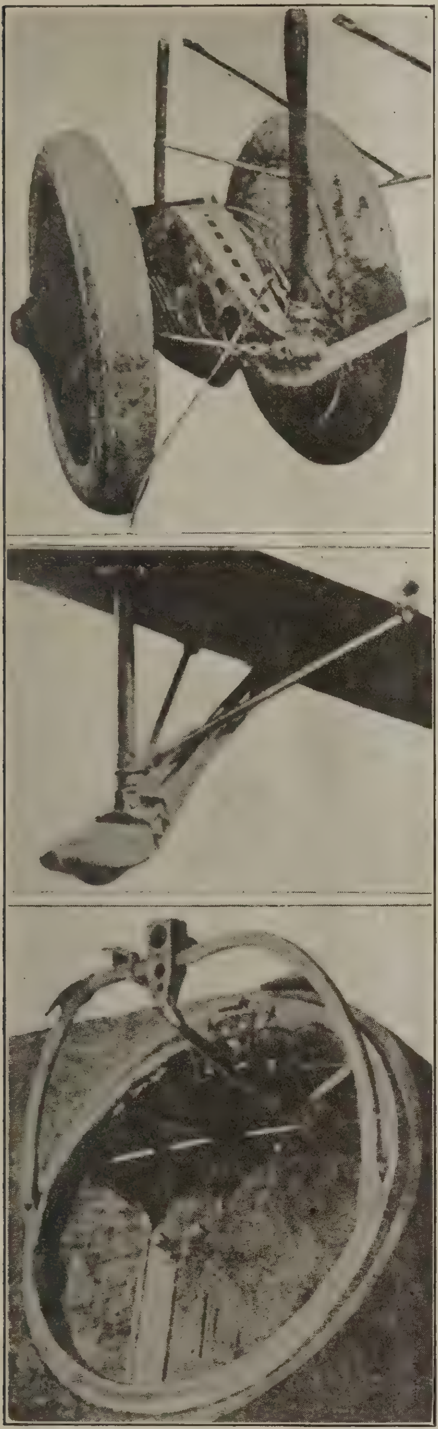
This is a somewhat crudely made device, employing two liquid levels, as indicated in the diagrammatic sketch Fig. 38. It will be seen that the reading gives the pilot an exaggerated idea of the angle of roll. The glass tubes are sealed up, and contain a dark blue liquid. One side of the dial is engraved Hängt links (Hangs left), the other Hängt rechts (Hangs right). The manufacturer is Arno Weisse, Berlin.

Revolution Counters

The dials give readings from 300 to 1,600 r.p.m. The sector between 1,300 and 1,500 is painted black, and these figures are marked with luminous compound, as also is the indicating hand. The manufacturer is Wilhelm Morell, Leipzig.

Air Pressure Gauges

These read from 0 to 0.5 kilogrammes per square centimetre. There is a red mark against



Main landing chassis, tail skid and machine gun mounting in the front of the fuselage

the figure 0.25 kg. The manufacturer is Maximall Apparat Fabrik, Berlin.

Electric Thermometer Dial

This dashboard instrument consists of a box-type meter, the dial reading from 0 to 100 deg. C. The figures 0 and 75 are accentuated by red marks. A switch at the side of the box, having positions marked 1 and 2, allows the temperature of either radiator to be read.

Petrol Level Indicators

These are of the Maximall type, and employs a float immersed in a tubular guide in the tank. This float communicates its motion to a finger working over a circular dial, by means of a thin cord passing over pulleys. These are encased in pipes, which are under the same pressure as the tank.

Electric Heating Rheostat

This is illustrated in Fig. 39. It is marked Aus (off), Schwach (weak), Stark (strong). There are two separate resistance coils, enabling the rheostat also to perform the function of a change-over switch.

Wireless

The machine is internally wired for wireless, and the left-hand engine is provided with a pulley and clutch for driving the dynamo. Reference to Fig. 22 will show that this is designed to be mounted on a bracket carried by the outside front engine bearer strut, and that the engine fairing is moulded to receive it.

Bombs and Bomb Gear

At each side of the covered-in passage way in the nacelle are bomb racks capable of holding five 25-pounder (12 kg.) bombs.

Underneath the nacelle are carried two large tubular frames, fitted with cradles of steel cable, and furnished with the usual form of trip gear. These racks would, it is believed, be capable of supporting a 300 kg. bomb a-piece. The bombs carried, however, evidently vary with the radius of action over which the aeroplane has to operate. The large racks are not permanently attached to the nacelle, but can easily be removed as required.

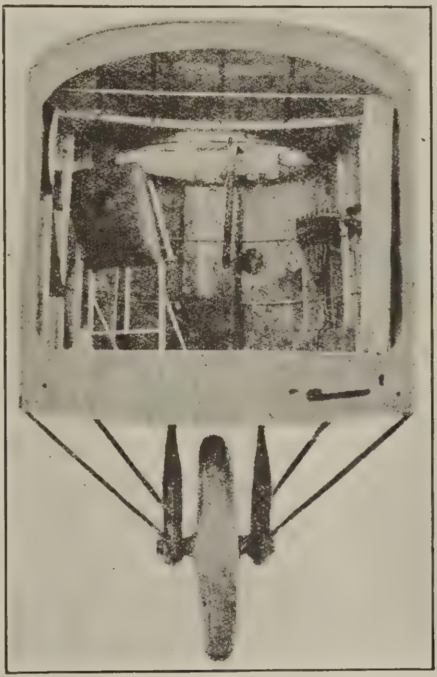
Inside the front cockpit from which the release of the bombs is conducted, there are seven triggers for the small bomb racks and two levers for the large bomb trips. The cables for this gear are carried under the floor, and are painted different colors for distinction.

Bomb Sight

The bomb sight carried on the machine presents no new features, and is of the ordinary German non-precision type.

Fabric and Dope

Two entirely different kinds of fabric are employed in the Friedrichshafen machine. The wings are covered with a low-grade linen of the class which is employed on most of the enemy machines. It is white in color. Compared with that of British fabrics, the tensile strength is fairly good.



The inside of the front cockpit

This fabric is covered with a cellulose acetate dope, and is camouflaged in large irregular lozenges of dull colors, including blue-black, dark green, and earth color.

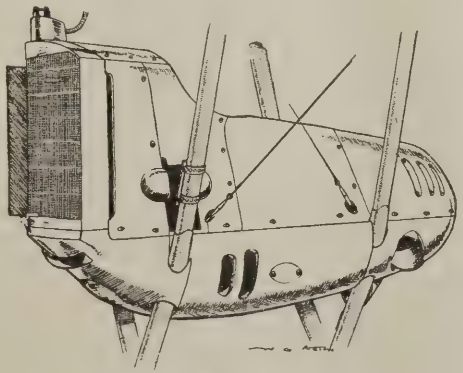
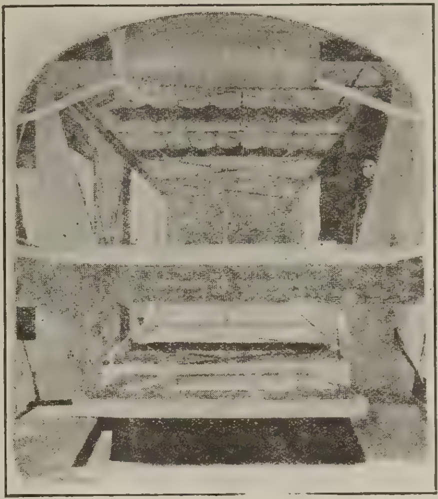


Fig. 22.



View looking down the inside of the fuselage, showing trap door and after-gunner's folding seat.

The other fabric, which is applied to the fuselage, tail planes, rudder, elevator fin, and landing gear, is apparently a cheap material, much inferior to British fabrics designed for a similar purpose. This fuselage fabric is dyed in a regular pattern of lozenges, the colors being hardly distinguishable from black. The dope is acetate of cellulose.

In both cases the dope seems to be carelessly applied.

Changes in Design

When compared with the Fdh. GIII., No. 177/17 (of 13/9/17), brought down by he French, this Friedrichshafen presents a few differences in detail design, amongst which the following points may be noted:—

(1) Engine fairing. In No. 177 spinners were mounted on the propeller bosses, and an aluminum ring of large diameter mounted on the rear extremities of the engine bearers in order to carry the rearmost fairing panels.

(2) Exhaust pipe. In the No. 177 this was, as in the present case, trumpet shaped and turned back at the end, but instead of a series of slots being used, the open vent was "bottled," so that the orifice was slightly restricted, and an additional circle of small holes provided.

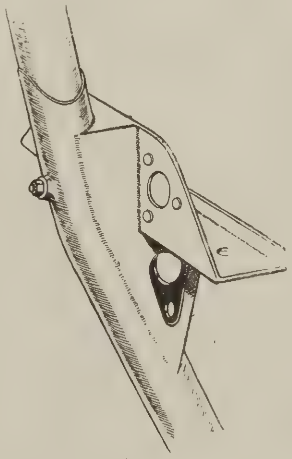


Fig. 21.

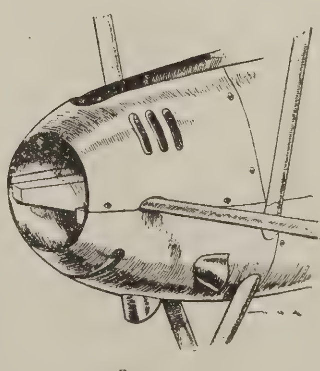


Fig. 23.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Capt. Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 3—Report by letter to Director of Air Service, Washington, D. C.

Note 4—Report to district manager of inspection, 581 Woodward Ave., Detroit, Mich.

Note 5—Report to Signal Corps recruit depot, Fort Wayne, Mich.

Note 6—Report to 814th Depot Aero Squadron, Bustleton, Pa.

Note 7—Report at Madison Barracks, Sacketts Harbor, N. Y.

Note 8—Report to Chief of Staff, General Staff, Washington, D. C.

Note 9—Report to Balloon School A, Arcadia, Cal.

Note 10—Report to Maj. Gen. W. L. Kenly, Dept. of Military Aeronautics.

Note 11—Report to San Francisco, Cal., and then to Mather Field, Sacramento, Cal.; assume command. Report by wire to D. M. A.

Note 12—Report to Director of Aircraft Production, Washington, D. C.

Note 13—Report to Fort Wayne, Mich.

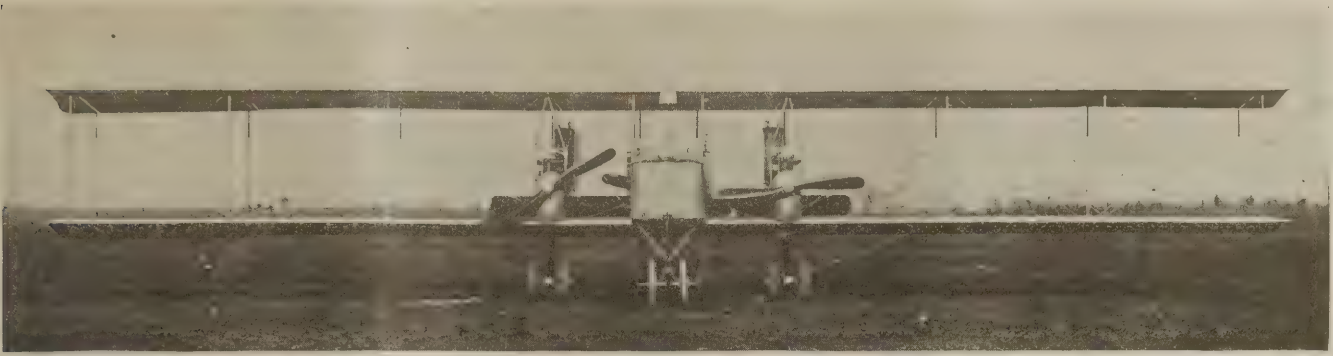
Special Orders Nos. 121 to 124, Inc.

A

Ayer, Carlton Sprague	SLR; CWT
Axley, Seth	TFT
Armstrong, Ralph S.	PFO
Appleton, Francis L.	EOT
Allen, Albert G.	EOT
Ammel, Roy W.	SLR; DIK
Atkins, Charles M.	SLR; DIK
Anglin, Charles H.	DIK
Ashe, Harry P.	BST
Abbott, Edwin Irving	SLR; GLC
Ames, Stanley Mitchell	SLR; GLC
Ames, Theodore G.	DIK
Atwood, Richard H.	FRF
Andrews, Frank H.	FRF
Aleshouckas, Joseph W.	FRF
Avera, John William	SLR; ELA; FRF
Ault, Bryd Moore	SLR; VBW
Armour, Philip D.	DIK
Arnold, Harold D.	DIS
Ammerman, Karl J.	FRF
Alton, Darrel Dow	FRF
Appleton, Francis V. L.	FRF
Ainsworth, Cyril	SLR; KST
Aten, Courtney N.	FRF
Alexander, Robert Plunkett	SLR
Apple, Addison A.	SLR

B

Bailey, James Reade	SLR; LDT
Barrett, Vinton Eli	SLR; CRI
Burton, John F.	FRF
Bond, Wilmer K.	BST
Buell, Llewellyn M.	CUI
Batts, Carl T.	SAG
Brokaw, John Abram	SLR; CRI
Bardens, William Marsh	SLR; KST
Brown, Edward A.	SLR; DIK
Bastow, Joseph G.	PFO
Brookley, Wendell H.	FRF
Butterworth, Benjamin T.	FRF
Braun, William P.	DIK
Bower, Raymond G.	FRF
Bramhall, Maynard	LHV
Brewer, Percy O.	DIK
Bender, Ned J.	SLR; DIK
Bramlette, James L.	DIK
Brunner, Charles F.	DIK
Bach, Albert	DIK
Bush, Bradford S.	FRF
Barbee, Stanley N.	FRF
Baisley, Herbert K.	PFO
Beck, William McR.	FRF
Behel, Vernon W., Jr.	SLR; DIK
Booth, Harold W.	SLR; DIK
Brown, Edward	SMM
Brown, Ralph E.	SMM
Brown, Alvin M.	FRF
Brown, David K.	SLR
Browne, William G.	RTR
Barnes, Earl D.	FRF
Barnes, Harold L.	FRF
Baxter, James L.	KST
Baxter, Robert Knighton	SLR; DIK
Burge, Kemp Stucky	SLR; DIK
Bryant, Howard P.	FRF
Babcock, Howard P.	FRF
Butler, Morgan	CSO
Bragg, Ellis J.	FLR; VBW
Booth, Franklin O.	FRF
Baker, John H.	SMM
Breece, George Elmer	MJR; VBW
Bates, Lloyd	SLR; VBW



A twin-motored Italian Caproni biplane. (Italian Official Photo)

Betty, Lee Irby..................SLR; VBW
Buckler, Douglas A......................CWT
Blackburn, Jack ....SLR
Bogel, Calitizin Newton.....................SLR
Bolz, Adolph Charles.....................SLR
Bramlette, James Lee.....................SLR
Burr, Walter Andrew.....................SLR
Bader, Eugene Francis.....................SLR
Baker, Robert Horace.....................SLR
Baughan, Stephen Decatur Large..........SLR
Barrett, William Joseph.................SLR
Babcock, Harry Allan.....................SLR
Barksdale, Julian Neal, Jr................SLR
Berglund, Eugene Nicholaus...............SLR
Belsky, Charles James.....................SLR
Baukat, James George.....................SLR
Bell, Robert Wendell.....................SLR
Berger, Earl Osborne.....................SLR
Blanchard, George Kinson.................SLR
Blount, Frederick Ripley, Jr..............SLR
Bond, Wilmer Krusen.....................SLR
Bruce, Parker ....SLR
Bullard, Edward Lauriston................SLR
Burns, LeRoy Wilson.....................SLR
Burroughs, William McCaffrey............SLR
Butler, Roy J..........................SLR
Butts, Daniel Edward.....................SLR
Balsinger, Ellis Corey...............SLR; EOT
Barber, Edward Milton..............SLR; EOT
Brokmeyer, Albert Fred............SLR; AAD
Bell, Alonzo Edwin................SLR; PMT
Baxley, James H........................FRF
Bilheimer, Earl L..................FRF; EOT
Bruch, Russell Lowerre.............SLR; PMT
Bels, Adolph C..........................DIK
Blair, Byron S..........................DIK
Burr, Walter A..........................DIK
Bogel, Galitsin N........................DIK
Blan, Ollie L............................DIK
Boutwell, Louis Evans..............SLR; GLC
Beck, George C..........................AGC
Burmeister, John C., Jr...................DIK
Bruett, William F........................TFT
Blackburn, James M......................DIK
Brady, Cletus J..........................FRF
Bailey, Raymond L.......................FRF
Barry, C. W.............................SPD
Breggen, Wilhelm C......................FRF
Baker, Kenneth C........................FRF
Bates, John H...........................FRF

C

Carpenter, Earle J.......................EOT
Cohen, Abraham P........................EOT
Cottrell, Roy W..........................EOT
Crane, George A.........................EOT
Chappell, Alfred B.......................UIU
Clark, John E............................FRF
Cull, Edwin E............................DIK
Cox, Artie G......................SLR; KST
Christie, Donald C...........SLR; DIK; FRF
Costar, Lloyd ....DIK
Corsant, Jessie H........................DIK
Cutter, Charles E., Jr....................PFO
Conrad, Max H...........................PFO
Chapman, William V......................TFT
Codington, Arthur D......................DIK
Chase, Paul W...........................TFT
Cole, Robert A...................SLR; DIK
Cameron, Burr S.........................FRF
Clauss, Albert Frederick...........SLR; ELA
Cooper, Lane Reed.................SLR; EOT
Cottingham, Kenneth ....OSU
Chapman, Edgar E........................FRF
Cook, William L. S.................SLR; DIK
Clark, Clinton Wesley..............SLR; CWT
Cook, Everett R..........................FRF
Corner, William B.......................SMM
Clelland, Stanley H......................RTR
Corsant, Jesse H..................SLR; FRF
Crittenden, William Robert.........SLR; DIK
Clarvoe, Frank Auld...............SLR; SPD
Chaddock, Homer Lester............SLR; KST
Calkins, Reginald J......................DIK
Cortright, Edgar M......................SMM
Chambers, Stuart M......................TFT
Chance, Percival H.......................DIK
Cleveland, Lyman W., Jr..................FRF
Coffman, Beirne H.......................FRF
Crowne, Irving H........................FRF
Coon, Sylvanus C........................MAT
Campbell, Walter Melville..........SLR; PMT
Cauthen, James Carlisle............SLR; CAF
Callaway, Richard E......................TFT
Cline, Harold Verne................SLR; RWT
Codington, Arthur D......................FRF
Cargo, Hugh G...........................FRF
Cottrell, Clifton C.......................FRF
Carley, Harry G..........................FRF
Christenson, Jens Tinus...................DIK
Claude, Laurens ....SLR; DIK
Carrigan, Robert M.......................FRF
Cutter, Edward B........................TFT
Cone, Charles L..........................DIK
Clark, Franklin W........................FRF
Carscadin, Henry L.......................DIK
Clark, Arthur Tillotson...................SLR
Cull, Edwin Emory........................SLR
Cone, Charles Luther.....................SLR
Campbell, Rudley Rhodes..................SLR
Chaffee, Robert Norton...................SLR
Coffman, Lionel Alton....................SLR
Campbell, Robert Burns...................SLR

D

Decker, Kenneth Neilson...........SLR; LDT
Denny, Hugh Roy..................SLR; KST
Dreyfuss, Albert Milford...........SLR; KST
Dede, Alexander L., Jr...................SGS
Doerr, William ....LHV

An observation outpost in the environs of Paris, observing enemy aircraft and warning the defenders of the city of their approach. (French Official Photo)

French Nieuport machines lined up for inspection at an American aviation school in France.
(British Official Photograph)

DeNoyelles, Harold E.	DIK
Dayton, Frank E.	TFT
Denie, George R.	PFO
Drennan, Leonard H.	RSD; TFT; PFO; FOB; CSO; Note 1
Deuel, Thorn	TFT
Dohr, James Lewis	SLR; CSO
Des Champs, James Wilcox	SLR; CAF
Doering, Harold	DIK
Davis, Edwin Kent	SLR; PMT
Edwards, Idwal H.	FRF
Dixon, Edwin Malcolm	SLR; PMT
D'Autremont, Hubert H.	FRF
Dooley, Thomas W.	FRF
Deutsch, Lee	WFO
Davies, William T.	RTR
Day, John George	SLR; VBW
Dickman, Frederick T.	FRF
Doty, David Ellis	SLR; DIK
Dillaway, Manson M.	FRF
Davidson, Edward C.	FRF
Dawson, Charles B.	AGC
Dean, Henry H.	TFT
Denie, George R.	FRF
Dickson, David C.	FRF
Dutton, Reece T.	RTR
Doggett, William K.	KST
Draper, Harold Dieckmann	SLR
Dyche, Justin Kimber	SLR; DIK
Denmark, Leonidas P.	SMM
Draper, Harold D.	DIK
DeNoyelles, Harold E.	FRF
Day, Curtis La Q.	SLR
Dewey, Robert Adelbert	SLR
Donovan, John Columbus	SLR
Drake, Joseph Horace, Jr.	SLR
Dake, Robert Edward	SLR
Daniels, William Charles	SLR
Dodds, Harry	SLR
Davis, Dalphin Alston	SLR

E

Eglin, Frederick I.	MAC
Elliott, John S.	UTA
Elliott, Irl J.	SLR; DIK
Everett, Edward C.	EOT
Ewing, Hugh W.	EOT
Erdmann, Robert W.	KST
Ellis, Richard W.	TFT
East, John H.	TFT
Eidson, Charles G.	MAT
Erhard, Ursinus Zachery	SLR
Ellett, Alexander	SLR
Elliott, Edward B.	FRF
Elliott William J., Jr.	SMM
Everett, Aylett L.	DIK

F

Fairman, Earl T.	EOT
Frick, Childs	SMM
Feasel, Fred	BST
Fraser, Frank William	SLR; EOT
Fickel, Jacob E.	RSD
Frothingham, Newton S.	FRF
Finlay, George D., Jr.	PUP
Farrar, Delwin B.	SLR; DIK
Forshey, Fred W.	UTA
Fowler, Louis F.	SLR; DIK
Foster, Esty	PFO
Fish, Frederick L.	FRF; PFO
Ferguson, George F.	SLR; DIK
French, Samuel L.	SLR; DIK
Frost, John A.	DIK
Fosnight, Reed O.	KST
Fuller, Willard P.	WFO; SBI; MAT; Note 1
Ferry, Clinton Sumner	SLR; GLC
Fish, Eugene R.	FRF
Fitzmaurice, William J.	MAT
Fisher, Randolph Ridgely	SLR; KST
Friend, Wilson B.	RTR
Freedman, Mark A.	SLR; EOT
Fox, Arthur William	SLR; CWT
Freeman, Charles M.	DIK
Fulwiler, Howard D.	DIK
Frankfort, Frederick	SLR; DIK
Foster, William Chapman	SLR
Fuller, Leonard Beeman	SLR
Fulton, Richard Wallace	SLR
Falcon, Guilford Ward	SLR
Faust, Thomas Carlyle	SLR
Flynn, Mortimer Gheens	SLR
Fowler, Lester Albert	SLR
Frank, Norman Daniel	SLR

G

Grazier, Oliver E.	DIK
Graham, Maurice F.	TFT
Goss, Lewis W.	PFO
Gross, Edward H.	FRF
Ganey, Daniel F.	FRF
Gause, George E.	FRF; EOT
Gill, Hamilton A., Jr.	EOT
Giddings, Lee C.	FRF
Goldie, William B.	SLR; DIK
Gandy, Robert L.	SLR; DIK
Gormley, Richard R.	SLR; DIK
Givens, James D.	DIK
Gilbert, Mager V.	RTR
Gilchrist, David H.	RTR
Gile, Leroy G.	RTR
Grimm, Clarence G.	RTR
Griffin, Howard P.	FRF
Gude, Adolph E.	FRF
Gale, Harold De Forrest	DIK
Gray, Ralph C.	DIK
Garrett, John W.	DIK
Gaalaas, Rudolph L.	SMM
Gastreich, Joseph W.	SMM
George, Harold L.	FRF
Gadbury, Joseph H.	KST
Gilbreth, Florian R.	KST
Gilman, Benjamin Henry	SLR; VBW
Gartz, Adolph F., Jr.	FRF
Gallagher, Joseph J.	FRF
Garey, Rayner	DMA
George, Marshall W.	DIK
Garroni, Rudolph	DIK
Garratt, Harold C.	AGC
Garrett, Joseph Robert	SLR; DIK
Giddings, Joseph Atwood	SLR; DIK
Gilman, Harold Abrams	SLR
Glanz, Carl Christian	SLR
Cowans, John	SLR
Gutzler, Raymond William	SLR
Griffin, Norwood	RTR
Glos, Walter Adam	SLR
Gouverneur, Fairfax Heiskell	SLR
Gray, Will Klapp	SLR
Graham, Arthur Seesums	SLR; DIK
Grimm, John Edward, Jr.	SLR

H

Harrigan, Leon J.	FRF
Hayden, Thomas H	FRF
Herrmann, Gerald F.	DIK
Haggerty, Stewart Anthony	SLR; LDT
Hall, Robert K.	BST
Higgins, Charles C.	EOT
Hinckley, Nelson C.	EOT
Henderson, John Sailer	SLR; LDT
Harrison, Landreth M.	PFO
Hoisholt, Arne K.	TFT
Hofflund, John L.	TFT
Haskins, George William	SLR; CWT
Harris, Benjamin T.	PFO
Hegan, Chester P.	PFO
Hillix, Albert F.	SLR; DIK
Holmlund, Gilber Emanuel	SLR; KST
Hopkins, Ward D.	SLR; DIK
Hardie, John F.	SLR; DIK
Hackedorn, Hillis F., Jr.	SLR; DIK
Harrigan, Cornelius Herbert	SLR; CWT
Hicks, John	SLR; GLC
Hanley, Harold Robinson	SLR; PMT
Harrison, Elbert Iredell	SLR; KST
Horne, Ernest Grover	SLR; RWT
Hilliard, Thomas J.	ASM
Howard, Alfred M.	DIS
Harris, Theodore	FRF
Huttig, William	SLR; KST
Herring, Lloyd H., Jr.	FRF
Higgins, Charles C.	FRF
Hunt, John L.	FRF
Holmes, Elmer M.	FRF
Halley, Gregory Leo	SLR; EOT
Heltzen, William S.	FRF
Hahn, Ralph W.	RTR
Hicks, Charles C.	SMM
Holmes, Raymond M.	KST
Harris, Joseph M.	Note 9
Howk, Clarence L.	DIS
Hamann, William P.	DIK
Harmon, Frank H.	FRF
Higbee, Walter F.	MAT
Hunt, Spencer S.	AGC
Houser, Paul F.	AGC
Holmes, George C.	FRF
Hinman, Donald M.	AGC
Huber, Howard F.	FRF
Haywood, Oliver C.	DIK
Hardman, James U.	RTR
Hurd, Mark M.	FRF
Hurd, Volney D.	FRF
Halpin, John Henry	SLR
Ham, Mark Neely	SLR
Hamilton, Pierpont Morgan	SLR
Hanson, Stanwood Lincoln	SLR
Harper, Oliver Clifton	SLR
Harvey, Harold Mellor	SLR
Heine, Bernhardt Edward	SLR
Heltzen, William Stanley	SLR
Hendricks, Walter	SLR
Hewitt, Robert Penrose	SLR
Hill, Edward Hugh	SLR
Hirshfield, Ira Wilson	SLR
Hiscock, Thorp	SLR
Hofstetter, Carl Frederick	SLR
Hone, Charles Byron	SLR
Hoyt, Fred Day	SLR
Huffman, Carl Fountain	SLR
Hamann, William Paul	SLR
Hansen, James Henry	SLR
Heywood, Oliver Charles	SLR
Hoadley, George, Jr.	SLR
Hyde, Gordon Eugene	SLR
Hallem, Harry	SLR
Hand, Julius Mills	SLR
Hawley, Herbert	SLR
Houser, Percy Thomas	SLR
Henry, Harold H.	RTR
Hanst, Charles E.	FRF
Hale, Herbert J., Jr.	TFT
Hamilton, John R.	DIK
Hays, William W.	DIK
Hughes, Francis F.	FRF
Hopkins, John H.	RTR

I

Ivins, Maurice H.	LHV
Illges, Abraham	LHV
Isbill, Paul Martin	SLR; RWT
Illett, Edward Wilson	SLR
Ingraham, Forrest Ward	SLR; CWT

J

Jones, Stanley Burdette	SLR; LDT
Jones, Nathaniel R.	MAC
Jones, Reginald L.	DIS
Jones, Leland S.	FRF
Jones, Lawrence M.	FRF
Jones, Elmer Hugh	SLR; DIK; FRF
Johnson, Leonard H.	Note 12
Johnson, George Stevens	SLR; PMT
Johnson, Everett B.	DIK
Johnson, Clare Thomas	SLR
Johnston, John W.	FRF
Jackson, Paul C.	FRF
Jackson, John S.	KST
Joscelyn, Douglass L.	FRF
Jaynes, John B.	DIK
Judge, Joseph B.	DIK
Jacobson, Chester J.	FRF
James, John R.	SLR
Jenkins, Nelson Durfee	SLR
Jenks, Henry Irving	SLR
Jensen, Charles C.	FRF

K

Kauffman, Carl Ruby	SLR; DIK
Keeling, Walter Sherman	SLR
Kelly, Bernard Edmund	SLR; DIK
Kelly, Oakley George	SLR
Kiefner, Charles Edward	SLR
Kinney, Judson Stevens	SLR; DIK
Kuhn, Leo Warren	SLR
Kilbane, James Anthony	SLR
Kennedy, Carl Francis	SLR
Kent, Thomas Thatcher	SLR
Kenly, Henry C.	PUP
Kenly, William L.	PUP
King, John Hollis	SLR; VBW
Kernan, William F.	FRF
King, Alfred F., Jr.	FRF
Krotzer, Henry W.	FRF
Kesemann, William, Jr.	SLR; EOT
Kenny, Raymond	DIK
Kanzler, Frederick C.	RTR
King, Harold W.	RTR
Keeling, Walter S.	FRF
Kelcey, George Guy	SLR; FRF; GLC
Kilroe, John C.	SLR; FRF; DIK
Kyle, William F.	DIK
Keith, Jerome	DIK
Krigger, Augustus H.	AGC
King, Ned E.	AGC
Kinney, Wallace Elliott	SLR; AAD
Keller, Frederick W.	FRF
Kritzer, Henry E.	FRF
Kohler, Carlos C.	DIK
Koehler, Herbert O.	TFT
Kent, Thomas T.	DIK
Kirkendall, Freeman B.	FRF
Kilbane, James A.	DIK
Krieger, John E.	FRF
Kibbe, Gordon M.	SMM
Kresge, Ellwood F.	PFO

L

LeDoux, Andrew P.	FLR; VBW
Lankey, Francis Irving	SLR; CWT
Lane, Herbert Vaughan	SLR; GLC; FRF

Lebensberger, Edgar Berger..SLR; GLC; FRF
Karkin, Edward James.......SLR; GLC; FRF
Lynch, Harry H.......................BST
Leohner, William E...................RTR
Lake, Harley W.......................DMA
Long, Winfred T......................EOT
Long, William F......................FRF
Leonard, Cecil E.....................DIK
Loudenback, Martin V.................KST
Lesley, Herbert ....SLR; KST
Livesay, George Byron...........SLR; CAF
Lindsay, Oliver Christian.......SLR; PMT
Lobdell, Jacob K.....................FRF
Lovelace, Lake ....FRF
Laureni, Fred C......................RTR
Lamar, Gres.er H.....................RTR
Lundgren, Theodore S.................DIK
Lyon, Peyton B.......................FRF
Lawson, Russell Herbert.........SLR; VBW
Lockwood, Lyman B....................AGC
Lewis, Hobart H......................TFT
LeBrou, Richard K....................FRF
Larson, Westside T...................DIK
Lanman, Ludlow T.....................FRF
Longstreet, Jack Y...................AGC
Lyons, Philip T., Jr.................FRF
Lewis, Richard P.....................FRF
Lindsay, Gordon J....................EOT
Leferink, Richard ....SLR
Liggett, Arthur George...............SLR
Lesley, Hubert ....SLR
Larson, Westside ....SLR
Lewis, David Everett.................SLR
Lawrence, Almon Rowell...............SLR

M

Merrick, Bentley Almerin........SLR; GLC
Madden, John Henry..............SLR; CAF
Machle, Jerome Benjamin.....SLR; PMT; FRF
Myers, Maurice C.....................SMM
Macomber, Henry W....................LHV
Moss, Harry S...................LHV; FRF
Morthland, Merle A...................LHV
Milburn, George Jackson.........SLR; PMT
Meyer, Emil Albert..............SLR; EOT
Moss, Douglas Rogers............SLR; EOT
Meredith, Evan K.....................RTR
Mader, Luther P......................FRF
Morgan, Herbert P....................DIK
Morsch, Jesse J......................DIK
Mayo, Robert C., Jr..................LHV
Mathews, James Christopher......SLR; RSD
Mollison, James Alexander.......SLR; RSD
Moore, John Sutherland..........SLR; RSD
Moore, Ralph Jacobs.....CPR; Note 4; WCS
Mersereau, Harrison Irving......SLR; VBW
Mahoney, Lawrence E..................FRF
Marvin, Arthur B.....................FRF
Mitchell, Donald H...................DIK
Meany, Philip J......................SMM
Mixter, Samuel ....PUP
Mulhall, Joseph Crawford........SLR; VBW
Marsh, Gerald Gilbert...........SLR; PMT
Moore, Charles C., Jr................DIK
Minter, Clark C.................SLR; DIK
Murphy, Charles F....................FRF
Mackie, Robert Francis..........SLR; EOT
Merrill, Patterson Davy.........SLR; EOT
Minshall, Robert ....FRF
Meyer, Carl D........................RTR
Metcalfe, John W.....................EOT
Mook, Samuel R.......................EOT
Murphy, Cyrus W......................EOT
Mulcahey, Edward P..............SLR; DIK
Maxwell, Robert R....................SMM
McDonough, Harry L...................TFT
Meeker, Nathaniel H., Jr.............FRF
Moody, Alvah E.......................LHV
Morrow, Clifford K...................FRF
Merritt, Edward K....................AGC
Morse, Eugene D......................PFO
Morrow George D......................DIK
Moores, Kenneth A....................DIK
Martel, Alfred, Jr...................DIK
Michels, Joseph S....................TFT
Moon, Odas ....SLR
Mitchell, Donald Harlow..............SLR
Moore, David Harris..................SLR
Matzger, Carlisle Leland.............SLR
Miller, Walter Lewis.................SLR
Moran, John Lally....................SLR
Munchhof, Theodore Joseph............SLR
Maynard, Kenyon Cushing..............SLR
Mahan, William Joseph................SLR
Moore, Julian E......................SMM
Morris, David R......................TFT
Mathews, David R.....................DIK
Magee, David W.......................FRF
Miller, Walter..................FLR; HHN

Mc

McGovern, John Francis..........SLR; VBW
MacNiel, Bruce ....SLR
McFarland, John Joseph...............SLR
McGrath, Michael Francis.............SLR
McMurphey, John William..............SLR
MacIver, Clarence Roscoe.............SLR
McBride, Howard Inman................SLR
McClelland, Harold C.................FRF
MacKenzie, Clifford R................FRF
McFarland, Frank H...................TFT
McDonald, George Clement........SLR; RWT
MacDonald, Harold F..................RTR
McKittrick, Peter W., Jr.............AGC
McDonough, Hubert Boniface...........SLR
McChesney, Samuel H..................TFT
MacAshbill, Burdette ....RTR
McKenney, Samuel Mortimer.......SLR; RWT
McKay, Edgar John Warink........SLR; EOT
McCaffrey, James Augustine......SLR; GLC
MacKenzie, Clifford Royal.......SLR; GLC
McGhee, Abner F., Jr.................FRF
McDonald, Hunter ....SMM
McNamara, John C.....................RTR
McCarron, William C..................SMM
McDonald, Samuel F...................DIK
McConacjie, Max ....FRF
McMurphey, John W....................DIK
McBride, Howard I....................DIK

N

Norris, John Langdon............SLR; CWT
Nelson, Roy A........................FRF
Neubauer, George Roberts........SLR; KST
Neubig, Earl E.......................BST
Noonan, George Carroll..........SLR; EOT
Naumann, Arthur P....................LHV
Nutter, Farr ....SLR; EOT
Nunenmacher, Francis W...............DIK
Newberry, Arthur C...................RTR
Newman, Augustus L...................LHV
Night, William J.....................TFT
Nims, Homer W........................DIK
Nicholl, John V......................RTR
Norris, John L.......................DIK
Newcomb, Frank H.....................RTR
Noble, William H.....................FRF
Nolan, Thomas J......................SMM
Niblack, Polk H......................FRF
Norton, Harrison Edson...............SLR

O

Olson, Carl N........................FRF
Oliphant, Rufus Alexander............SLR
Osgood, William Thompson........SLR; VBW
Orr, John C..........................TFT
Orr, Dale ....SLR; RSD
Olds, James H. S.....................BST
Olds, Milford Hixon..................SLR
Ormsbee, Eugene R....................RTR
Oliver, Ralph A......................SMM
O'Shea, Edward Marshall..............SLR
O'Connor, Thomas Francis........SLR; EOT
O'Brien, James H.....................FRF
O'Brien, John J......................RTR
O'Malley, Joseph J...................FRF

P

Preisch, Herbert Edmund.........SLR; VBW
Petticord, Leslie Lewis.........SLR; CAF
Pearce, Henry G...................Note 5
Partridge, Joseph Arlington.....SLR; GLC
Prish, Cheaney L.....................BST
Payne, Bryan W.......................BST
Pilatsky, Louis ....DIK
Phipps, George R.....................CUI
Parker, J. Brooks B.........REL; Note 8
Parish, William Love............SLR; EOT
Parshall, Raymond P..................FRF
Parsons, Frederick C.................FRF
Peterson, James H....................FRF
Pollister, Raymond S.................RTR
Pennington, Jerome E.................DIK
Prime, Charles P.....................RTR
Peters, Sidney V. W..................TFT
Poindexter, Earl W., Jr..............SMM
Pascale, Harry ....FRF
Picklesimer, Bryant H...........SLR; VBW
Pennewill, John M....................DIK
Pardridge, Clinton E.................LHV
Pickrell, Floyd M....................TFT
Palmer, Hubert P.....................DIK
Pinkstaff, Everett W............SLR; DIK
Patterson, Robert A..................TFT
Parker, Harold W.....................FRF
Perry, William L.....................FRF
Pyke, Robert W.......................FRF
Pruter, Frederick ....TFT
Palmer, Franklin H...................FRF
Pedler, Harry W.................SLR; DIK
Price, Kenneth T.....................FRF
Pilcher, Rufus J................SLR; DIK
Paulson, Carl F......................FRF
Pitrate, Charles Stuart..............SLR
Paige, William Julius................SLR
Pennington, Jerome Edward............SLR
Phelps, Samuel Bixby.................SLR
Poleman, Thomas Theobold.............SLR
Prosser, Frank Hallam................SLR
Post, John Hawthorne.................SLR
Potter, James Harold.................SLR
Proctor, Willis Heath................SLR

Q

Quaintance, Charles Linsley..........SLR
Queen, Harold Ellis..................SLR
Quayle, Fred A.......................RTR

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Hydroaeroplanes on the beach at the Key West Naval Aviation Station, Florida

FOREIGN NEWS

FRANCE

The French official announcement for June 3rd reports successful aerial combats and extended bombing operations. The text of the announcement follows:

"Our aviators continue to be very active. During the days of the 1st and 2nd of June they made, with their usual spirit, journeys of reconnoissance, observations, and chase. Twenty-nine German aeroplanes were brought down, twenty-four were compelled to land out of control, and four captive balloons were shot down.

"Our bombarding squadrons have increased their activity over the entire battlefront. One hundred and thirty tons of explosives have been dropped on convoys, assembling centers, and bixouacs occupied by the enemy, notably in the region of Croucy, Soissons, Vierzy, Villers-Helon, Neuily-St. Front, and La Fère-en-Tardenois.

On the 1st and 2nd four other German machines were destroyed by our anti-aircraft guns."

The French official for June 4th says:

"On June 3rd our bombing escadrilles, forcing a passage of the enemy lines, brought down two enemy aeroplanes. Three other aeroplanes and two captive balloons were brought down by our pursuit machines. The same day twenty-one tons of projectiles were dropped on marching troops, artillery columns, and revictualing convoys. On the same objectives twenty-eight tons were dropped on the night of June 3-4.

"On June 4, in the course of a double expedition in the valley of the Savieres, our bombing escadrilles dropped more than seventeen tons of projectiles on enemy concentrations, which were completely dispersed. On the night of the 4th about fourteen tons of explosives were dropped on the railway stations at Fismes, Fère-en-Tardenois, Roye and Bohain.

"Four enemy machines were brought down and two captive balloons burned. An enemy machine on a grand model, having four motors, was brought down on the night of June 1-2 in the region of Nanteuil-le-Haudouin. Its crew of eight men was made prisoner."

On June 5th nineteen enemy aeroplanes were brought down or forced to land out of commission. A German captive balloon was burned. The same day and the following night twenty-five tons of explosive were dropped by our bombing machines on the cantonments, depots, railway stations and convoys in the enemy zone. A great fire followed by explosions was observed in the station at Fère-en-Tardenois.

Allied air raids on Trevis last Saturday, killed two persons and injured four, according to a despatch received from Coblenz today. Most of the bombs fell in the fields.

German aeroplanes raided the Paris district on June 7th through a heavy defensive barrage. Some bombs were dropped.

One person is reported dead and several wounded. Material damage was done.

The "all clear" signal was sounded at 12:20 a. m. Friday.

German aeroplanes during recent raids on Paris have made use of an illuminating device which is a combination of a rocket and a clock movement. The bomb is dropped, and when it explodes it releases a linen parachute provided with a cartridge containing a substance with a magnesium base.

This substance is lighted automatically 300 to 400 meters above the ground, and for two minutes projects an extremely bright light over objects below it. The German aviators have carried out their bombing operations with the assistance of this light.

GERMANY

The Berlin announcement for June 3rd says that 31 Allied aeroplanes were shot down.

The German official for June 6th as regards aviation says:

"During the last two days forty-six aeroplanes and four captive balloons have been brought down. Richtofen's chasing squadron shot down fifteen enemy aeroplanes yesterday."

GREAT BRITAIN

The official report on aerial operations of June 3rd says:

"Yesterday our aeroplanes carried out a good deal of observation for the artillery and took many photographs. Eighteen tons of bombs were dropped by our aeroplanes, and heavy machine gun fire from the air was directed upon a great variety of targets.

"Eight German machines were destroyed in air fighting, and fourteen were driven down out of control. Three of our machines are missing.

"On Sunday night we bombed Le Cateau, St. Quentin, and Valenciennes railway stations and dropped eight tons of bombs. All our night-flying machines returned."

The British official communication dealing with aerial operations issued June 4th says:

"There was less activity in the air yesterday. There was some reconnoissance and photographic work carried out, and in the course of the night a total of eighteen tons of bombs was dropped by our aeroplanes. The targets chiefly attacked were the railway stations at St. Quentin, Douai, and Luxemburg.

"Three hostile machines were brought down in air fighting, and one was driven out of control. None of ours is missing."

The communication dealing with aviation issued June 5th was:

"The weather was overcast on the British front yesterday and the enemy's aircraft were not active. One hostile machine was brought down by our aeroplanes and another driven down out of control. One German balloon was destroyed.

"Besides reconnaissance work and artillery co-operation we dropped during the day and night fourteen tons of bombs; we lost no machines."

London, June 6.—The British official communication dealing with aviation issued June 6th says:

"Wednesday night our long distance bombing machines again attacked the Metz-Sablons station triangle and also the railway sidings at Thionville, dropping five tons of bombs with good results, although the visibility was indifferent. Thursday morning the railway station at Coblenz was heavily attacked by us. Good bursts were observed on the railway line. All the machines emerged safely.

"The fine weather of Wednesday enabled our airmen to carry out much photographic, reconnaissance and artillery work. twenty tons of bombs were dropped on different targets, including hostile dumps and railway billets, the Armentieres and Roye stations and the Zeebrugge seaplane base.

"In addition our long distance day bombing machines heavily attacked the railway station and barracks at Treves and the Metz-Sablons railway station and the railways at Karthaus, returning without loss.

"Seven hostile machines and three German observation balloons were shot down during the day by our airmen and three hostile aeroplanes were driven down out of control. Four of our machines are missing.

"Wednesday night thirteen tons of bombs were dropped by us on the St. Quentin, Boesinghe, Cambrai and Armentieres stations. All the machines returned."

The British official communication concerning aviation operations says:

"Our airmen took advantage of the fine weather on the British front Thursday to accomplish much useful work in reconnaissance and photography. Together with our observation balloons, they ranged our guns on many hostile batteries.

"In air fighting fourteen German machines were destroyed and eight others were driven down out of control. Several observation balloons were destroyed by our airmen and another hostile aeroplane was forced to descend by our anti-aircraft fire.

"During the day we dropped twenty-eight tons of bombs and a further eleven tons in the course of the following night. Among the targets attacked were Valenciennes, Le Cateau, Busigny and the St. Quentin railway station.

"We lots one machine during the day."

London, June 8.—Aerial operations by the British are described in an official statement issued to-night as follows:

"In the air a good deal of observation and photographic work was carried out by us on June 7. Bombing was active on both sides. We dropped twenty-three tons of bombs on railway junctions, aerodromes, and dumps beyond the German lines.

"Twelve machines were brought down by our airmen, and seven were driven down out of control. We lost three machines."

London, June 9.—The official report on aerial operations issued this evening says:

"Low clouds hampered work at Saturday, but our aeroplanes constantly attacked the enemy behind his lines with machine gun fire. Our squadrons, co-operating with the French, heavily bombed Nesle and Fresnoy-les-Roye, nine tons being dropped.

"During the following night two tons were dropped on a railway station and dump east of La Basse.

"In the course of twenty-four hours four hostile machines have been brought down and tw oothers disabled. None of ours is missing."

On June 3rd the British Admiralty issued an official communication regarding aerial operations, the text of which follows:

"During the period of May 30th to June 2nd, inclusive, bombing raids were carried out night and day against the following military objectives: Bruges and the docks of Zeebrugge and Ostend. Several tons of heavy bombs were dropped on the objectives with good results. Photographs confirm great damage to the large engineering works at Bruges.

"Three enemy machines were brought down in flames and three driven down out of control. Three of our machines are missing.

"In home waters during the above period numerous anti-submarines and escort patrols were carried out and long reconnaissances were made across the North Sea. Submarines were sighted and attacked, and enemy mines were located on several occasions.

"During a North Sea patrol a Zeppelin was sighted and chased by our seaplanes, which were unable to get sufficiently near to engage her effectively. One of our seaplanes is missing."

A review covering naval aerial operations during the period from June 3 to 5 has been published by the Admiralty.

"Eight bombing raids," it says, "have been made on the following military objectives: Zeebrugge, Ostend, Bruges, and the Thourout railway junction. Large quantities of heavy bombs were dropped. In the course of aerial fighting two enemy machines were destroyed and three driven down out of control. One of our machines is missing.

"In home waters during the same period escort duties and anti-submarine patrols were carried out. Submarines were sighted and attacked and enemy mines located on several occasions.

"A squadron of glarge seaplanes carried out a long reconnaissance over the North Sea. A large formation of hostile machines was met and engaged, resulting in two enemy machines being shot down. On the return journey two of our machines were forced to alight close to the Dutch coast owing to engine trouble. They have been interned."

A dispatch from Madrid dated June 6th, says:

"A British aeroplane fell at Rio Muni, Africa, recently, and the pilot and observer, who were not injured will be interned at Cordova, Spain."

Rio Muni, or Spanish Guinea, is a Spanish possession on the western coast of Africa south and southwest of Kamerun, which formerly was a German possession.

The British official summary of aviation activities for the month of May gives a total of 518 planes brought down; 398 German machines brought down by British airmen, 20 brought down by anti-aircraft gunfire, 100 enemy machines driven down out of control, making a total of 518 aeroplanes destroyed or damaged. In addition, seven observation balloons were destroyed.

ITALY

A British-Italian official statement issued June 4th, says:

"Since May 25th, the Royal Air Force has destroyed fourteen enemy aeroplanes and driven one down out of control. One British machine failed to return."

The War Office communication issued June 5th, says:

"A captive balloon was brought down on the bank of the Piave River.

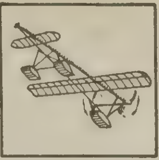
"Monday evening four enemy aeroplanes were downed."

The Italian War Office issued the following official statement regarding the air fighting of June 8th and 9th:

"Our airships and aeroplanes bombed railway stations, aviation camps and enemy hutments and attacked troops in movement with machine gun fire. At Nattarello station the explosion of a large ammunition dump was observed.

"Our aviators surprised an aviation camp between the Piave and the Livenza and the railway station at Caldonazzo while in full activity and effectively bombed them. Ten hostile machines were downed."

MODEL NEWS



Edited by John F. McMahon

Scale Model of Nieuport Made of Wood

THE model of "Spad" shown in a recent issue has been received by model builders with such favor, that I have decided to publish the Nieuport shown in the cut below. The "Spad," while being a well built model, did not show its characteristics as well as this one, because of the enclosed motor of the Spad.

The Nieuport machine is a well known scrapper, and, of course, a model of the large machine will attract considerable attention.

The construction of this model is much the same as the "Spad" shown previously, the wings and body are of wood and the wheels are aluminum disc with rubber tires; they are 2 inches in diameter, the landing chassis struts of this model, and the "V" strut at the rear of the top plane over the fuselage are made of ⅛ inch brass tubing.

The ailerons are imitation only, a slot being cut in the top wing on each end to represent the opening between wing proper and aileron.

The "V" interplane struts are made of wood fitted together at the apex and wrapped with thread and glue. They are then inserted into place and glued to the wings.

A small model of a Lewis machine gun made to 1/24 actual size is mounted on the top of the plane. The gun is built of brass tubing, the magazine being turned out on a lathe and notched to represent cartridge spaces.

The engine is an exact duplicate of a Gnome 7-cylinder and is the main part of the model. The crankcase is made of a ¾ inch piece of dowel ½ inch long. The cylinders are made of ¼ inch dowel with rings of cardboard glued on to represent cooling flanges. On the top of cylinders to represent a cylinder head, the male end of a snap hook such as women use for waists is used, to which is soldered a pin bent to represent a push rod and a valve rocker, a piece of tubing 1/6 inch is then put through the crankcase and this supports the engine and allows it to revolve, at the same time acting as a propeller shaft.

The engine is then given two coats of aluminum paint and when dry varnished.

The engine cowl is made from the bottom of a tin cup; this is also painted aluminum.

The model is painted with a combination of blue and grey paint to give a sky blue tint. The French insignia, blue, white and red circles are painted on the planes and blue, white and red stripes are painted on the rudder.

The Caproni, De Haviland, Burgess Seaplane Scout, Handley Page models will appear later. All of which were made of wood and were on exhibition recently at Meyrowitz stores on Fifth Ave., New York City.

All of the models, I have just mentioned were built from photographs and drawings appearing in AERIAL AGE.

The reader will notice a dummy aviator in the pilot's seat. This was made from modeling wax such as is used by sculptors and the like.

Model Aeroplane Building as a Step to Aeronautical Engineering

AFTER attaching our propeller in place, we are ready to study the machine by flying it.

To fly, it is necessary to twist the propeller in the reverse way until rubber is sufficiently tightened and then release allowing propeller to spin and dig its way forward.

To get the best results out of the model, it is necessary to balance properly. This being done exactly as we did to balance the glider.

When starting the model on its flight, hold the propeller from turning with the left hand and the body or frame of the model with the right hand. Just a second before throwing model gently on its way allow propeller to spin and gain its required speed. The same instructions for flying the glider apply to this model.

We will now go to the racing model. This is a light affair and is the real flying stick type of model but it has its advantages in teaching aviation to the beginner because it allows a good study of aeroplane flight because of the long flight that may be accomplished with a model of this kind. While a model of this type is built as light as possible to allow for the maximum flight, it must be built strong enough to withstand hard usage and the strain of two rubber motors.

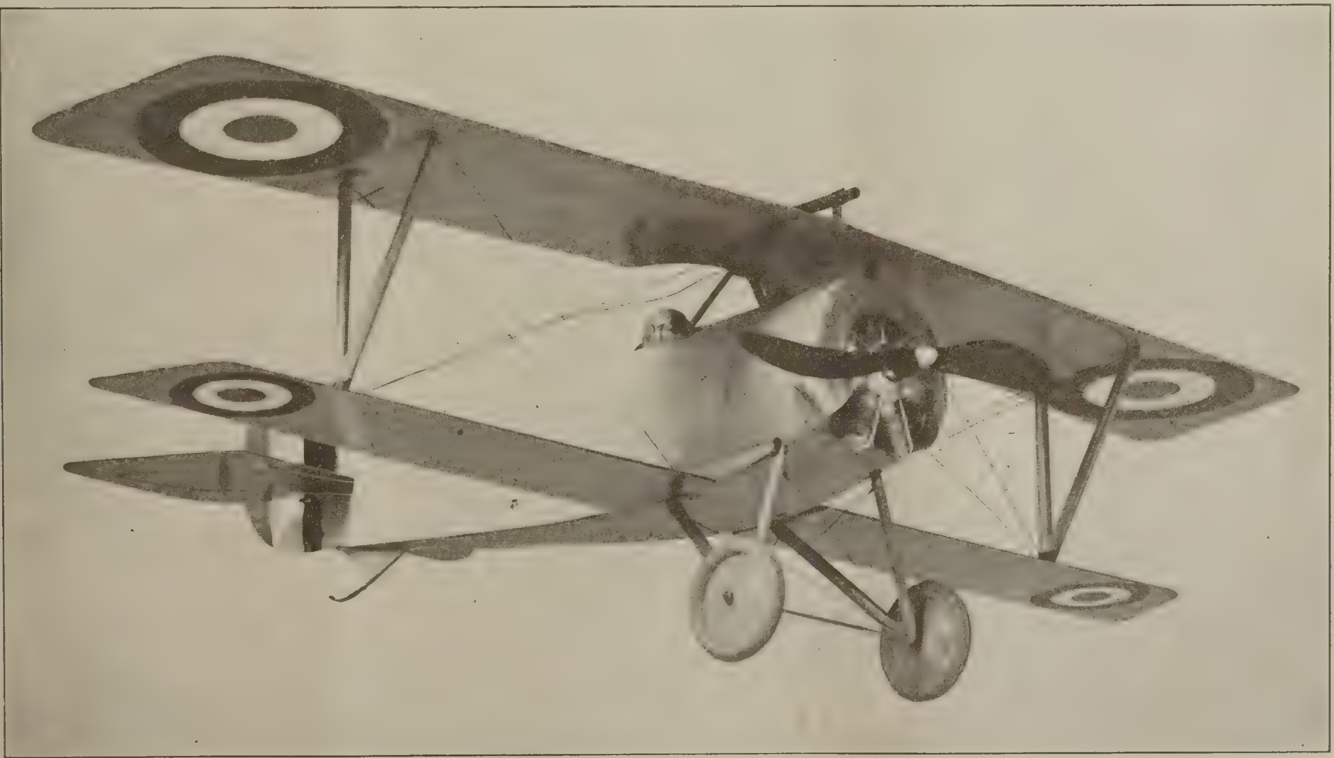
The scale flying stick model has no resemblance to a big machine and should a large machine be built to the same scale as a model of this kind, it would fall apart in the air because it would not be strong enough to support its own weight.

A word of praise must be made for this type of model inasmuch as it takes all the ingenuity the model builder can master to beat some record another has made, and it is the real foundation of the study of aeroplane flight.

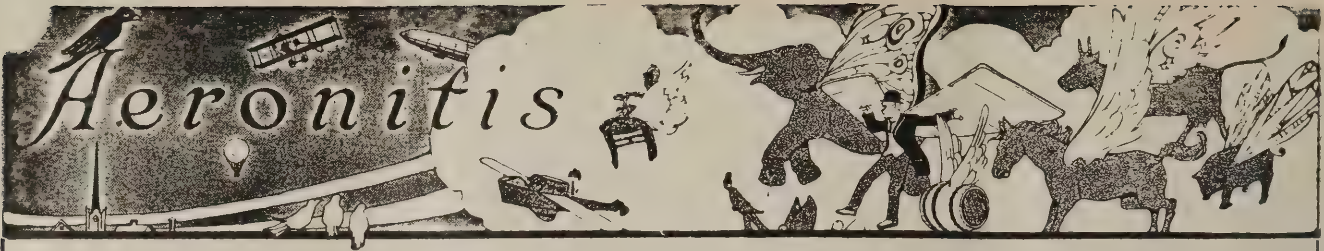
Scale flying models have some advantages over the Flying Stick type of model because they actually resemble the large machine and when flying behave like their big prototypes, but the flight of a scale model does not last as long as the Flying Stick type and for that reason, for the time being, we will treat on the light racing type model to become better acquainted with power driven machines.

The racing model aeroplanes are mostly Pusher Type, that is the propeller instead of being located in the front or nose of the machine, are at the rear, one propeller turning the reverse way to the other and each driven by separate rubber motors.

(To be continued)



Scale model of a Nieuport made of wood



Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Ole Travis Mam'y Has First View of an Aeroplane

IT was a "befo' de wah" negress standing on an Austin street corner yesterday morning, waiting for a street car. She toted one of those old-fashioned black shiny valises, a relic of celluloid collar days, and her some 200 or more pounds of weight was topped by a tiny black hat crowned by some frost-bitten looking objects that might have passed for plumes during Harrison's administration.

Puzzled by Aeroplane

One didn't have to use field glasses to see she was from the country. She simply radiated good humor. Or at least she did until she heard the whir of an aeroplane perhaps a thousand feet above.

Then she registered, as the movie director might say, "uneasiness." She quickly glanced from right to left, then front to rear. In either direction she saw nothing to fear.

The whir grew louder and harsher. Suddenly she saw the plane, a gigantic bird sailing far overhead.

Thought It a Bird

"Mister, what sort uv a bird is dat dere," she tremulously asked a passerby.

"That isn't a bird, aunty; that's an aeroplane. It's an automobile of the air. And the man in it is a soldier."

Turkey Buzzard Man

"Aryplan'! What's dat? How come man up dar flyin' 'bout like a turkey buzzard? Tell me dat. Dat's some sort uv a big hawk. Lemme 'lone, mister. I'se goin' 'way from dis here place."

"Look at it now, aunty. See, it's making a turn and is coming lower. Don't you see the man waving his hand?"

She Couldn't See a Man

"Naw, sir, I doan see nothin' 'cept dat it ain't no folks up dere. Lemme 'lone, I tell you I'm goin'."

By that time a coterie of onlookers had assembled, some trying to explain the aeroplane was no bird.

But she steadfastly refused to be convinced.

Insisted It a Bird

"'Tain't no man up dere. Dat's some sort uv a bird," she muttered to every explanation.

"Up dere" the birdman swerved and curved, passing and repassing overhead.

"Let me explain it to you, aunty," said a listening aviator, who wore the bars of a lieutenant.

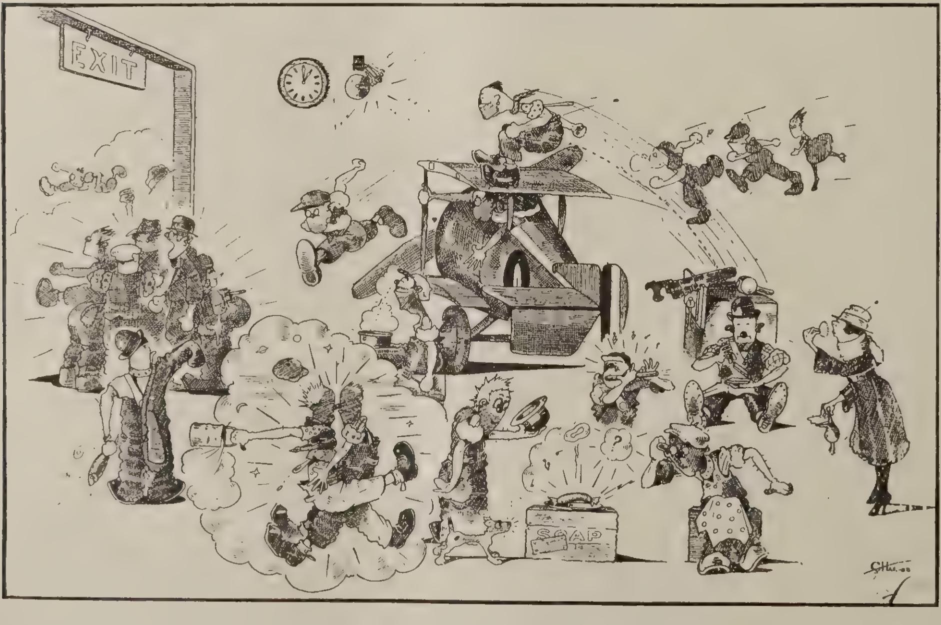
"Well, what you know 'bout it?" she asked him, with something between fear and defiance.

"That is a man up there, and he is riding in an aeroplane, a thing made with an engine that will fly in the air, just like a street car runs on a track or an automobile on the street.

No War for Her

"We are at war now. Those things flying up there are made to fight the enemy with. And——"

"How cum we at wah now? Didn't we whup the Yankees more'n fifty years er-go? You'all kain't pester me. Dat ain't no man, dat's a bird," said the old woman, as she stalked ponderously down the street, leaving a very much crestfallen lieutenant of Uncle Sam's army, who heard his attempted explanation of "why's an aeroplane."

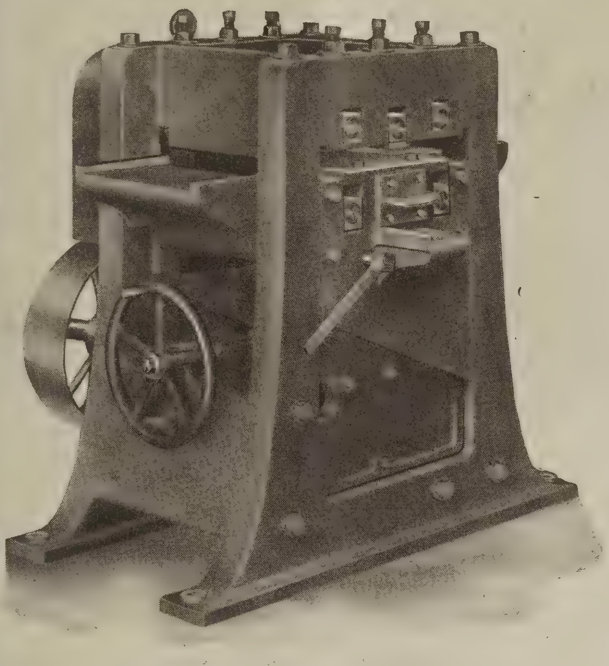


An Aircraft Factory at lunch time. The efficiency and scientific "motion saving" methods are applied in this period, just as they are when the mechanics are at work. Note the two workmen attempting to occupy the same extent of space at the same time, without any regard for the well known law of physics.

Courtesy "The Aeroplane"

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a



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If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

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Sanders, Randolph R.	EOT
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Schiffer, Wilson Ermlich	SLR; VBW
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Schaefer, Albert E.	TFT
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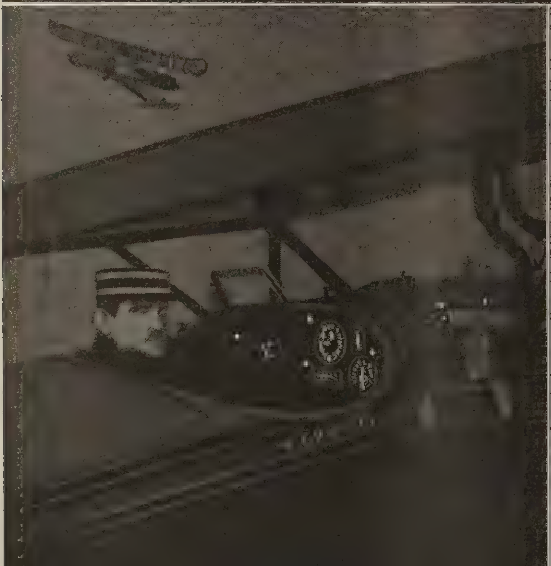

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Wood, Warren C.	BST
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Woodard, James W.	DIK
White, Chester M.	FRF
Worden, Frank L.	RTR
Willrich, Edgar C.	BST

Y

Young, Russell Alvin	SLR
Young, Ora Wesley	SLR
Young, "B"	FRF
Yost, Harold S.	RTR

Z

Zuberbier, Ross John	SLR; GLC; FRF
Zender, Frederick A.	FRF
Zander, William E.	PFO
Zipse, William E.	GLC
Ziegler, John W.	DIK

(*Continued from page 675*)

weakened raw material to reach the factory, and to some of the more serious defects which even a careful inspector may easily overlook, and to the danger of such material entering into aeroplane construction. The maximum efficiency can be attained only by expert, rigid and unremitting inspection all along the line, but beginning in the woods and at the sawmill.

Office of Investigations in Forest Pathology
Bureau of Plant Industry,
San Francisco, California.

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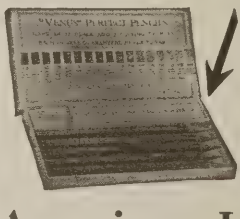

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Dayton. They brought word that the plants visited were rapidly reaching a quantity production basis.

Members of the sub-committee, which is composed of Senators Thomas of Colorado, Reed of Missouri, Smith of Georgia, New of Indiana, and Frelinghuysen of New Jersey, declined to anticipate their report by a detailed account of the trip. They expressed themselves, however, as pleased with the showing now being made, and predicted that from now on there would be a marked improvement in the situation. The production of Liberty motors, they said, is increasing steadily, and will very shortly reach a point where it will meet American demands.

While away the Senators witnessed a number of tests of the Liberty motor. While there are certain questions yet to be worked out in order to improve and perfect it, they say, the tests were very satisfactory.

Because of the Army Appropriation bill now pending before the Military Committee, plans for resuming the inquiry are uncertain. Members of the sub-committee said their work had only started, however, and that before beginning the hearing of testimony in Washington they expected to make other inspection tours.

Aerial Mail Service of the Future

(Editorial in N. Y. *Times*)

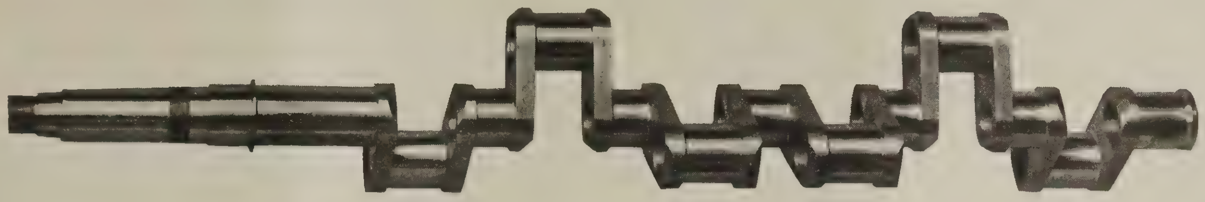
THE best authorities upon aeronautics, including inventors, entertain no doubt that the safety of the improved aeroplane will be limited only by the fallibility of pilots and mechanics and by unseen flaws of material used in construction. According to expert judgment, the aeroplane will compete with the automobile as a means of conveyance and communication. The inexorable demands of war have done more for the aeroplane than could have been expected from many years of industrial peace. A swifter, stancher, safer flying machine is a compensation of the war. It has multiplied trained pilots into the scores of thousands.

After the war inventive minds will evolve a motor compared with which our vaunted Liberty will seem like an experiment in the retrospect, and every one of the essential parts of the fabric that carries the motor will be perfected. So say scientists interested in aeronautics. Their confidence is infectious. There is no cause for wonder if the Post Office Department, which has been experimenting with an aerial post between New York and Washington, is now planning an extension of the service to all parts of the United States. This is the program:

> Flights between Chicago and other Middle West cities and Eastern points, and, finally, transcontinental flights.
>
> Washington to Chicago flights in from seven to nine hours.
>
> Establishment of flights in sections not accessible by trains.
>
> Aerial routes where circuitous approaches, due to canons, lakes, and other natural objects, make ordinary mail deliveries unusually slow.
>
> Final interlocking of the entire country after the war with aeroplane mail service for letters and packages.

The longer the route the greater the superiority of an aeroplane mail service over a railway service. The Empire State Express could run from New York to Chicago in eighteen hours; a high-power aeroplane would cut the time in half. A relay of aeroplanes would reduce the schedule between New York and San Francisco to thirty hours. Some day there should be an aerial express for a thousand and one articles, perhaps a service for perishable products. Baggage carried through the air is conceivable.

Of the hosts of war pilots many will be open to engagement when peace returns: to fly for the Government, for corporations and individuals. Now they are defying machine guns, aircraft guns, and diabolical devices of the busy mnuition-makers. In peaceful times these flying men will have to contend only with the elements. How beatific the transformation! Fogs, snowstorms, lightning will become as familiar as friends. "We are training aviators now," says Mr. Praeger, Second Assistant Postmaster General, "with the intention of using them for the aeroplane mail service when they return from aviation in France." It will be exhiliarating as well as remunerative work, and it may be supposed that the supply of aeroplane drivers will be greater than the demand eventually.



AEROPLANE CRANKSHAFTS

Wyman-Gordon Company Worcester, Mass., U. S. A.

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NEW YORK CITY U.S.A.

(Continued from page 676)

retors — Ignition systems — Lubrication—Types of aviation engines: Gnome, Hispano-Suiza, Curtiss, Thomas-Morse, Hall-Scott, The Liberty Motor.

VII. Types of Aeroplanes—Wright double pusher biplane—Curtiss pusher—Curtiss tractor — Antoinette monoplane — Bleriot monoplane—Deperdussin monocoque—Hanriot monoplane—Martin tractor biplane—Signal corps tractor—Spad tractor aeroplane—French Nieuport speed scout—Sopwith tractor biplane—U. S. Army Dunne type biplane—German Taube monoplane—German Aviatik tractor biplane—Twin-motored Caudron—Farman biplane—Vickers pusher—Bristol speed scout—Voisin fighting biplane—German Albatross—Marine aeroplanes and flying boats: Wright aeroboat, Curtis flying boat, Leoning monoplane aeroboat.

VIII. Flying—The forces acting on an aeroplane in flight—Stability and airworthiness of aeroplanes—Pitching—Stalling and diving — Rolling and lateral balance — Turning—Skidding and side-slipping—Directional stability—Spirals—The tail-spin — Hydroplaning — Military use of aeroplanes—Scouting and fighting planes—Special requirements for war work—The training of an aviator.

For further information address Prof. Paul Klapper, Director of the Summer Session, at the College.

Men In Uniform Ask for New Fiction

"The soldiers persistently ask for new novels, which never seem to be part of the gift shipments," writes one camp librarian to the Library War Service Headquarters of the American Library Association.

"I find a special need among the patients for up-to-date reading matter," writes the chaplain of a base hospital. And from a hospital librarian comes an appeal for new fiction.

In the three million books given by the American people for camp library use, there are few 1918 novels. It is true that old books, like old friends, are always welcome, but the new ones are wanted too.

With vacation days at hand, many people will be buying recently published novels to read during summer hours on boats, in camp, or at home.

Annual Meeting of Pennsylvania S. A. E.

Philadelphia, Pa.—More than 100 members and guests attended the annual dinner of the S. A. E., Pennsylvania Section, held at Hotel Adelphia, after a visit to the Hog Island shipyards. Among the speakers of the evening were Mr. Harry Tipper, Mr. D. Ludlum, Mr. H. L. Horning and Mr. William B. Stout, technical adviser to the Aircraft Production Board.

Mr. Stout pointed out the great difference between the development of aircraft production and that of production in other lines, such as shipbuilding, due to the fact that there was no accumulated experience in aircraft production in this country when we entered the war. This was largely due to the patent situation, which made entrance into the aircraft industry equivalent to the purchase of a law suit. Apropos of the criticism made on the Liberty aircraft engine some time ago a certain prominent British flyer, in speaking before a society composed of British and Canadians, said that he had driven every aircraft engine that had been used on the front, but he had never been behind an engine that would compare with the Liberty engine.

Mr. Stout said that on account of our tremendous service facilities we would have very little trouble with engines, and that most trouble would be with the so-called connecting details. Aeroplanes are now capable of climbing about as fast as the heart of the aviator will stand. It is America's part in winning the war to make the aeroplane a production job which it is not now.

As regards lubrication of aircraft engines, good service is given by both mineral oil and castor oil. The Liberty engine does not require castor oil. Mr. Stout also spoke of the German giant aeroplanes with five engines, which took part in recent raids on London, and which carry 3,000 pounds of bombs, each bomb weighing 600 lbs. It has not yet been learned whether the engines were of the 160 or 260 h.p. type. Two inch and three inch guns are now being used on aeroplanes and machines which are being used by the Germans to co-operate in infantry attacks carry an armor under the fuel tank and the cock pit. Recently many of the German Albatross planes have collapsed in the air, which is due chiefly to the fact that this plane was originally designed for a 160 h.p. Mercedes engine, but later, in order to increase its speed and climbing power, a 260 h.p. engine was substituted.

One Cent a Mile Fare for Soldiers

Washington, D.C.—A special rate of approximately one cent a mile on the railway systems controlled by the Government is to be allowed the men of the Army and Navy who intend visiting their homes before going overseas, according to the following announcement issued by the U. S. Railroad Commission on May 24th: "Director General McAdoo, realizing that the payment of the full railroad fare means a serious hardship to our soldiers and sailors who desire to visit their homes before going overseas, has ordered that as soon as necessary details can be completed soldiers and sailors of the United States forces, when furloughed and traveling at their own expense, will be granted a rate of approximately one cent per mile. This fare will be available on delivery to ticket agents of certificates signed by commanding officers. Such certificates of standard form will be prepared and distributed with the utmost promptness." The order will extend the special privilege to the men in training at all camps and training stations under the jurisdiction of the War and Navy Departments.

Governor Cox Predicts Aerial Offensive

New York City.—Governor James M. Cox, of Ohio, in an interview in New York intimated that he fully expected to see the Germans driven out of the air and thus enable the infantry to undertake a sweeping offensive. "And we need not be surprised to see the German navy destroyed by aeroplanes," he added.

One-Thousandth Liberty Motor Shipped by Detroit Manufacturer

Detroit, May 29th.—The one thousandth Liberty aeroplane engine produced by a local motor company was shipped from the factory on May 29th, just a year from the day the first blueprints were sent to Washington.

The Packard Company, first to get into production, is turning out twenty-five motors a day. The Lincoln Motor Company is completing ten a day, with a much larger output immediately in sight. The Ford Motor Company, which has made thousands of the cylinders for both Packard and Lincoln, is on the eve of producing motors in quantity. The Marmon Company also is about to enter production.

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AERIAL AGE WEEKLY

Vol. 7, No. 15 JUNE 24, 1918 10 CENTS A COPY

At 2,000 Feet Somewhere in the U. S. (Photo courtesy of Captain Hugh L. Willoughby)

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Aero Club of America Supporting Secretary Daniels in Fight for Extension of Navy Personnel

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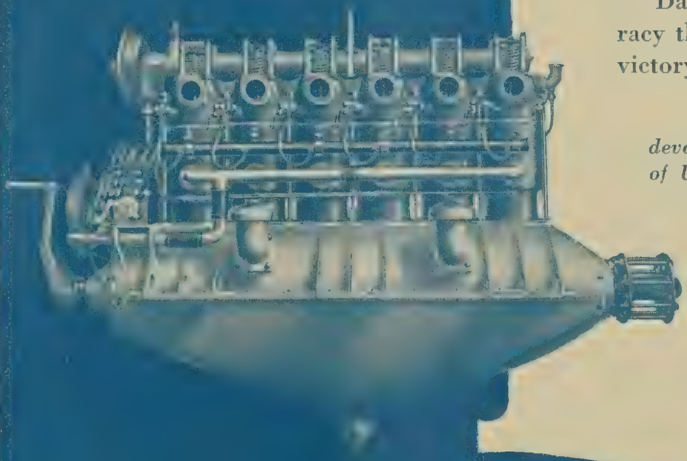

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VOL. VII NEW YORK, JUNE 24, 1918. No. 15

AERO CLUB SUPPORTING SECRETARY DANIELS AND ADMIRAL BENSON AND ADMIRAL PALMER IN FIGHT FOR EXTENSION OF NAVY PERSONNEL

SUPPORTING Secretary Daniels, Admiral Palmer and Admiral Benson in their demands for an increase of the personnel necessary to properly man the fleets, Mr. Alan R. Hawley, President of the Aero Club of America, and for 4,000 additional men for naval aviation, has written to Congressman Lemuel P. Padgett, Chairman of the Committee on Naval Affairs of the House of Representatives, pointing out that Mr. Padgett is responsible for the lack of aerial coast patrol organization necessary to defeat the U-boats.

Mr. Hawley's letter to Mr. Padgett is as follows:

"My dear Mr. Padgett:

"Like many other Americans, I have read with a feeling of indignation of your persistent efforts to prevent the expansion of the personnel of the Navy, as shown by the letters of Secretary Daniels, Admiral Benson and Admiral Palmer to you, urging the increase of the personnel to the point necessary to properly man our fleets.

"You are assuming now, while the country is facing the greatest of dangers, the same attitude which you assumed in 1916 towards the bill to provide for the establishment of an aerial coast patrol. Because of your opposition, the country was deprived of an efficient aerial coast patrol, which could in the intervening two years have been developed to such a point of efficiency that no U-boats could operate with impunity in American waters.

"We submit that the fact that U-boats have been operating in American waters and have destroyed over 40,000 tons of shipping without being themselves destroyed is incontrovertible evidence that your obstructive attitude at the time has cost the country an enormous price.

"Because of your opposition to the Johnson-Kahn Bill, which would have provided $1,500,000 for the organization of the Aerial Coast Patrol in 1916, and would have given two years' time in which to organize an efficient aerial coast patrol, now that the U-boats are operating in American waters, we find ourselves inadequately equipped to meet the U-boats, and find by using all the Army aviators and land aeroplanes available we have been unable to prevent the U-boats from sinking our ships and destroying American lives and property.

"Had you not obstructed this plan, the head-lines in the papers at the time when the first U-boats began to operate off the American coasts, would, no doubt, have read:

"'U-BOATS BLOWN UP BY OUR AERIAL COAST PATROL.'

"We would have had such head-lines if we had been ready to meet the situation; but, admitting that the U-boats had come entirely unexpected and had sunk a few ships, the head-lines within a few days would have read:

"'U-BOATS SANK THREE SHIPS. HAVE BEEN DESTROYED BY OUR AERIAL COAST PATROL.'

"At the time when we pleaded for the adoption of the Johnson-Kahn bill, there were about 50 patriotic young Americans learning to operate seaplanes at their own expense, so as to be ready to meet an emergency. About 2,000 more were ready to take up training, provided they could take this training under the supervision of a naval officer, but the Navy did not have the officers to assign to supervise this training, and, as you refused to bring up the Johnson-Kahn Bill for the consideration of your Committee, you prevented the full development of a reserve aerial coast patrol.

"Fortunately, over 100 patriotic young men continued their aviation training at private expense, and they were subsequently taken over by the Navy, and are now in the Executive and flying branches of the Naval Air Service.

"If this much was accomplished notwithstanding your opposition and disapproval, how much could have been accomplished had you taken a broader attitude towards the matter? We undoubtedly would have had several thousand fully trained reserve aviators and aerial coast patrol stations at every 20 miles along our Atlantic coast.

"We cannot plead ignorance of what was necessary, because reports were available at the time of what French and British naval authorities had found it necessary to do to protect their shipping from U-boat attacks. We had, in fact, a fearful example of what would happen if we did not prepare immediately, because these British and French authorities were trying to get sufficient aeroplanes and aviators to establish aerial coast patrol stations at every twenty miles along their coast to be able to meet the U-boat menace fully. And a few months later the French Minister of the Marine, in his report to the French Chamber of Deputies, which was published broadcast, said:

> "'We have found it necessary to organize seaplane stations all around the coasts, so that the zone of action of each station joins that of its neighbor on the other side.'

"We submit that the results show that in taking the position you took in preventing the organization of the aerial coast patrol in 1916, you assumed more responsibility than any man was justified in assuming in the face of such a crisis as this country was facing. We again feel so in regard to your efforts to prevent the increase of the personnel necessary to properly man the fleets, and we submit that you owe a public explanation to the country of the reasons, if you have any, for your obstructing policy—a policy which has already been so costly to the country.

"Admiral Palmer, in his letter to Secretary Daniels of June 12, made public yesterday, states:

> "'On paper the fleet and shore organizations of the Navy appear to be ready for any emergency, but, actually, they are not, simply because they are lacking in proper officers at the head of the various sub-divisions. Until we get officers in sufficient numbers in the higher grades, the organization cannot be ready to meet the emergency. To fail to recognize this situation is to court national disaster.'

"Your opposition to the aerial coast patrol in 1916 has resulted in the U-boats giving us an idea of what Admiral Palmer means, and, therefore, steps should be taken immediately not only to grant the absolute minimum number of officers which the Navy may get along with, but to grant the maximum required, so that such important branches of the Navy as the aerial coast patrol, training of aviators and production of seaplanes may be put under the direction of Rear-Admirals.

"Very sincerely yours,
"(Signed) ALAN R. HAWLEY,
President, Aero Club of America."

BRITISH PARLIAMENT URGES NEED OF THOUSANDS OF AEROPLANES TO WIN THE WAR IN AIR

THE British Parliamentary Air Committee at a meeting on June 18, demanded that the Government take action to stimulate the production of aircraft.

Another demand was for reprisals for the recent German bombing of the Red Cross hospitals in France. The destruction of one of the Rhine towns was demanded in reprisal for the action of the Germans.

Joynson Hicks, who is a member of Parliament and chairman of the committee, in an interview with the New York Sun said:

Huge Programme Demanded

"We intend to demand a huge air fighting programme for the spring of 1919 and also to impress the Government with the fact that the war will be won in the air. To do so the Allies must have hundreds of thousands of aeroplanes. We understand that the Liberty engine is not ready for air purposes yet and wish to impress upon the Government the vital necessity of keeping up an abundant supply of high power engines.

"We will propose the following resolutions:

1. This committee desires to reiterate its grave anxiety in regard to the supply of sufficient high powered machines for the next year's campaign and that unless the Secretary of State for Air and the Minister of Munitions are prepared at the end of this meeting of the committee to make a statement as promised in the House of Commons, they must press for debate on the subject.

2. They desire to reiterate their grave anxiety at the heavy loss of life in training pilots in this country and will be glad to know whether the Secretary of State for Air will confer with them upon the problem.

Investigation Is Asked

3. They feel that the question of the Lochdoon airdrome (in Scotland) cannot be allowed to remain in its present inconclusive position and that for the honor of the air service further investigations must take place and the responsibility fixed upon whomsoever was guilty of such unwarrantable waste of public money. The Lochdoon airdrome has been constructed at an expense of millions, but never has been used.

4. They view with horror the action of the Germans in attacking with bombs and machine gun fire British hospitals in northern France and trust the Government will take resolute and definite steps, possibly by the way of destruction of one of the Rhine towns, to convince the enemy that actions of this kind cannot longer be tolerated.

5. They consider the position of the Secretary of State for Air, without a seat in either house of Parliament, is highly unconstitutional and request that the Government provide the date for the discussion of a resolution on the subject.

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

BY sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aero post service each, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M		A. M		A. M		A. M.
G. P. O. . .	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq. . .	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times . . .	10.40
D	10.20	O	10.35	Y	10.30	Tomp . . .	9.40
F	10.30	P	10.20	College . .	10.05	Tremont .	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent. .	10.55	Wash. . . .	9.46
I	10.20	T	8.35	H. G. . . .	10.00	W. F. . . .	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of the mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only eleven cents (11c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making twenty-four (24c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.

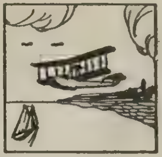
THE AIRCRAFT INVESTIGATIONS

IT was disclosed June 13 that Charles Evans Hughes has extended the investigation of the work of the Aircraft Production Board. His findings will not only include a report on the charges that irregularities were permitted in the outlay of funds, but will also give to the nation a comprehensive statement of the reasons for the Board's failure to create a large number of planes for use abroad. It is understood that the extension of the scope of the investigation is undertaken with approval of President Wilson.

The examination of the witnesses is conducted behind closed doors at offices in the Department of Justice Building.

(*Continued on page* 741)

THE NEWS OF THE WEEK



W. C. Potter on Aircraft Board

Washington, June 17—William C. Potter of New York was nominated by President Wilson to be a member of the Aircraft Board.

William Chapman Potter is essentially a production man. He started life as a mining engineer, and after many years in that work both in Mexico and this country he became identified with the production of automobiles, vice-president of the Guaranty Trust Company and president of the Intercontinental Rubber Company.

Mr. Potter is in his forty-fifth year. He was born in Chicago, and after studying at the Chicago Manual Training School was graduated from the Massachusetts Institute of Technology in 1897. For a time he prospected on his own account in the Rocky Mountains and then, as a mining engineer, entered the employ of several mining companies.

In 1901 he became mining engineer for the Atchison, Topeka and Santa Fe Railroad, resigning two years later to enter an engineering firm. In 1904 he was engaged by the Guggenheim Exploration Company and became resident manager of the Guggenheim interests in Mexico. He gave up that position the following year to accept the post of general manager of the interests of the American Smelting and Refining Company and the American Smelters Securities Company, both in this country and Mexico. Mr. Potter served both as a director and member of the executive committees of those companies. He became president of the Intercontinental Rubber Company in December, 1911.

In addition to his post as vice-president of the Guaranty Trust Company, Mr. Potter recently has been a director of the Allis-Chalmers Company, the Maxwell Motor Company, and the Richmond Radiator Company. He is a Republican, but never has taken an active part in politics. He is a member of the Metropolitan and the New York Athletic clubs. His home is at 177 East Seventy-first street.

Our Air Schools Abroad Colossal

The New York *Times* special correspondent, in conclusion of the first authorized description of the work accomplished by the American forces since they landed in France, writes of visits he paid to several of the new American flying schools. He says:

"I am convinced that these American boys will rank among the best fliers in combat work at the front. On a recent Sunday morning at one of the flying centres I visited there were perhaps sixty machines in the air at once, some practicing in formations, some doing ordinary stunts, some advanced acrobatics, and others hard at combat work.

"At another point some distance away I was equally impressed with both the work in progress and the working plans of one of the extensive so-called 'air service production departments.' This important centre of activity, which is typical of several now in course of construction, covers a tract of land over six miles long by a mile and a half wide, where the construction, assembling, testing, and repair of American aeroplanes will soon be going ahead full tilt on a scale never before known. The work splits into four main divisions—transportation, production, construction, and supply."

Capt. A. C. Weidenbach, the head of the aero mail fliers

Pays $1,000 for Envelope Addressed By President

Noah W. Taussig, a philatelist for more than fifty years, on June 11th, paid $1,000 for an envelope bearing President Wilson's autograph and one of the new twenty-four cent aerial mail stamps, which was sent on the first airpost trip from Washington to New York.

The envelope was auctioned off at the Collectors' Club for the benefit of the American Red Cross.

Gives Sea Girt for Aviation

Governor Walter E. Edge, of New Jersey, in a telegram to the chief of the aviation section of the War Department at Washington, June 11th, tendered the Federal Government the use of the State Encampment at Sea Girt as a permanent or auxiliary aviation station.

British Here On Special Mission

Washington.—Lieut. Col. John Cyril Porte of the British Royal Air Force, with Major Parsons of the same arm, arrived in Washington on June 11th, associated with a special mission connected with our aerial programme.

Porte was recently decorated by King George, who made him a commander of the Order of St. Michael and St. George for distinguished services during the war.

Lieut. Col Porte was the aviator who had planned to fly across the Atlantic. His plane was being built for him in this country by Rodman Wanamaker and he was just about ready to start when the war broke out. He returned to England and resumed his duties in the navy.

Supervisor of Aero Mail

Capt. Adolph C. Weidenbath, of the Signal Corps, who has seen three months' service as a flier with the American Expeditionary Forces, has been appointed as a supervisor of the aeroplane mail service between Washington and New York, succeeding Major Reuben H. Fleet, S. R. C., who has been transferred to a flying school in California. Captain Weidenbath's appointment is pending the development of the service at a point where it can be turned over to a successor.

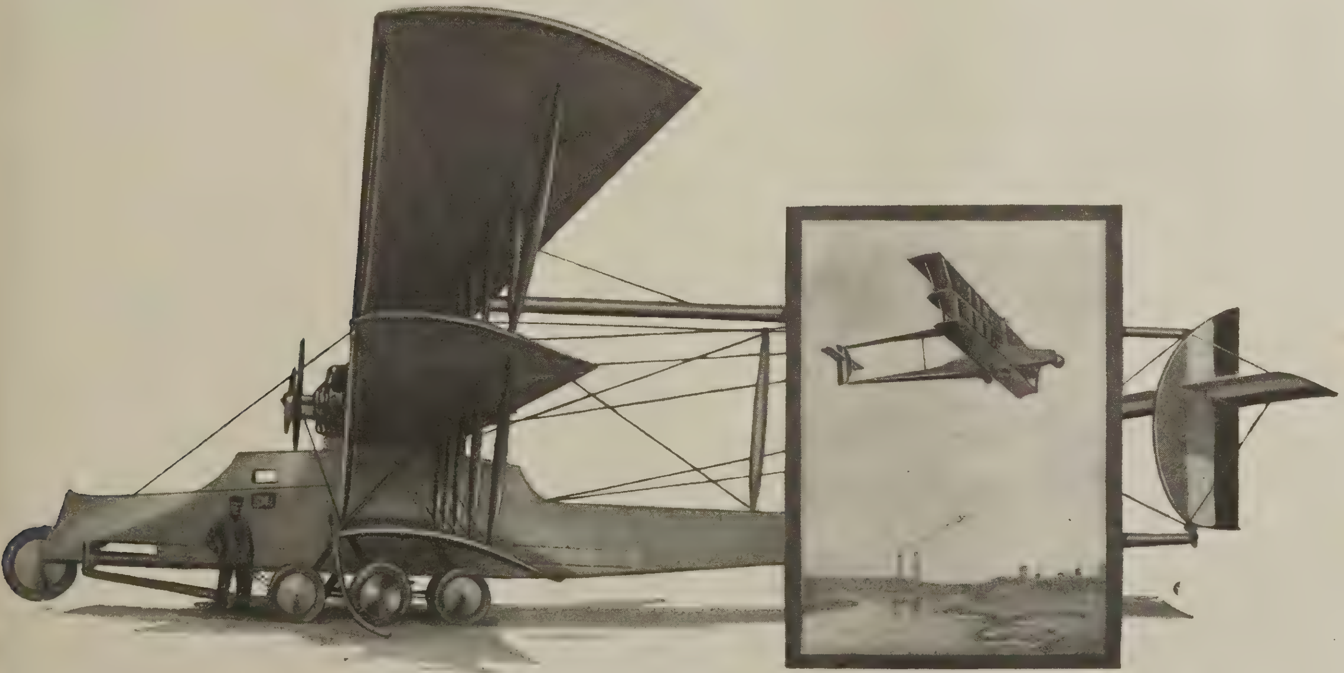
May Shift Aerial Landing

Washington.—The aerial landing at Belmont Park, Long Island, N. Y., now used by the aeroplane mail service, may be shifted to Branch Brook, near Newark, N. J. This site is now being inspected because its location offers better facilities for transferring the mail to the New York post office.

To Investigate Aeroplane Accidents

Washington.—There will be an investigation by a special committee of Congressmen into the causes of accidents in the American aviation training schools, according to a resolution introduced in the House of Representatives June 5th. The resolution says: "It is reported that some at least of the accidents at the American aviation fields were due to the defective construction of the aeroplanes and in no wise to the fault of negligence of the aviator." The sum of $5,000 is authorized to pay the expenses of the investigation. The speaker is to name the committee.

The committee will make recommendations for action for the prevention of such accidents in the future.



The first photograph of the Voisin Triplane published in America. (French Official Photo.)

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A "Penguin" or "Grasscutter", a plane with reduced wing spread which cannot rise more than six feet off the ground. Used for teaching the controls to student aviators

Aero Mail Beats Thunderstorm and Breaks Records

Lieut. Culver broke the Aero Mail service record both for speed and height on June 12th, when, with a Liberty motor driven aeroplane he made the trip from Philadelphia to New York in forty-two minutes, at an approximate average rate of 127 miles an hour, attaining during the flight a height of more than twenty thousand feet. At Trenton, N. J., he overtook a thunderstorm travelling in the same direction, passed through it and beat it to New York by nearly half an hour.

Aviator Jack M'Gee Killed

East Greenwich, R. I.—Jack McGee of Pawtucket, an aviator who had given many exhibition flights in this country, was killed in an aeroplane accident June 11th while flying over Narragansett Bay.

The machine in which McGee was killed sank and efforts to recover the body of the aviator were delayed pending the arrival of a derrick.

Phil Rader in Fatal Accident

San Francisco.—Aviator Phil Rader, killed in an aeroplane accident June 10th, at Buffalo, N. Y., was well known as a sporting page cartoonist on a San Francisco newspaper.

At the outbreak of the war he enlisted in the Foreign Legion and during his term of service continued his work as a cartoonist, syndicating his output to the Chicago *Daily News* and other publications.

Later he was assigned to the Royal Flying Corps, and after several months' service in France was sent to the United States to act as instructor.

Major Bishop, V. C., D. S. O., M. C., Leads Flying Circus

Toronto.—After supervising aerial gunnery instruction in England for some time, Major William A. Bishop, V.C., D.S.O., M.C., Canada's noted air fighter, has had his wish granted and has gone to the front in command of a "circus."

Major Bishop was the premier airman of the Royal Air Force when he left France, much against his will, to become Director General of Aerial Gunnery for the Royal Flying Corps. He has up to date a record of forty-seven German aeroplanes which he has destroyed. He was decorated by King George at Buckingham Palace, with the Victoria Cross, the Distinguished Service Order, with a bar, and the Military Cross. This was the first time in history that these four decorations had ever been conferred on any one man at the one time.

Military Aeronautical Instructors Not Available for Line Duty

Washington, D. C.—Officers of the Corps of Instructors, Signal Corps, appointed with a view to their utilization as instructors in schools of military aeronautics and designated as such in the orders directing them to report for duty, are not available for duty as line officers nor for assignment to tactical units. The primary duties of these officers are those pertaining to the instruction of cadets in the schools of military aeronautics. Their services may not be utilized for any other training. These duties will be performed under the supervision of the commanding officer of the School of Military Aeronautics.

Amsterdam-London Air Mail Is Planned

The Hague.—Plans have been made for postal service between Amsterdam and Groningen by aeroplane under the direction of the military air service. The military authorities will also cooperate in establishing an air service between Amsterdam and London. Mails will be sent by the air route twice a day, the time of transit varying from one and a half hours to two hours, according to the weather.

Mail for Aviation Camp

Washington.—Postmasters are requested to instruct patrons to address mail for United States aviation squadrons at Camp Morrison, located in the vicinity of Morrison, Va., as follows:

"The name of the post office, Morrison, Va., should not be included in the address. Mail intended for the military personnel at Camp Morrison should not be included in packages for Morrison, Va., but should be sent direct to Newport News, Va., labeled, "Aviation Branch."

American Airmen in France

According to a press report of June 17th, Sergeant David E. Putnam, of Brookline, Mass., has established a new record by bringing down five German aeroplanes in one day. Three of his victories are official and the other two are being investigated. The other two, if they are officially accredited, will make Sergeant Putnam's total thirteen, the greatest number to the credit of any American flier. At present Lieut. F. E. Bayliss tops the list with twelve.

General Pershing's statement regarding aviation, issued on June 15th, says:

An American air squadron carried out the first all-American bombing raid on June 14th, destroying certain German military establishments near Metz.

Eight aeroplanes dropped ten bombs each on cantonments, supply sheds and railways in the vicinity of Metz, Dommary and Daroncourt.

A second excursion of American bombing planes was made late that afternoon behind the German lines. Five American machines launched seventy-nine bombs, weighing two kilos each, on the railway station and adjoining buildings at Conflans.

Two German aeroplanes were destroyed and another apparently was driven down out of control by American aviators on the Toul front.

All the American aviators returned safely, though they had been heavily shelled by anti-aircraft batteries.

An American observation balloon was shot down on June 16th by a shell from a German gun. There were no casualties as a result of the incident.

Another Escape

San Antonio.—Lieutenant "Pat" O'Brien, of Illinois, Royal British Flying Corps, who is in the United States after having escaped from a German war prison, fell nearly 2,000 feet in an aeroplane here, but was only slightly injured.

A postcard received from Germany states that Sergeant Carl Kerwood, of the Lafayette Escadrille, formerly of Bryn Mawr, Pa., who disappeared on March 31st, is a prisoner in Germany, and is in good health.

Clarence B. Shoninger, of New York, also a member of the Lafayette Escadrille, who disappeared on May 29th, when setting out for a patrol fight over the German lines, had just applied for transfer to the American force.

American Airmen in France

June 11

Brigadier General Benjamin D. Foulois has been detached from his post as chief of the air service of the American expeditionary force and appointed by General Pershing as head of the air service of the "first army."

This information was received June 11 from France. Colonel Robert N. Paddock will succeed General Foulois, probably with early promotion to the rank of Brigadier General.

June 12

Arthur Blumenthal, of Wilmington, N. C.; Harold Y. Saxon, of Washington, and Allan Nichols, of Palo Alto, Cal., all members of the Lafayette Escadrille, are missing after a bombing raid over the enemy lines.

Captain Charles Biddle, of Andalusia, Penn., who was recently wounded and brought down in No Man's Land on the British front, has recovered and resumed fighting.

June 13

Washington, June 13.—The following communique from General Pershing regarding aviation was issued June 13:

"Last night our aviators bombed with good effect the station of Dommary Baroncourt, northwest of Metz. All our machines have returned."

New Chevron for Short Service

Washington.—Special insignia to designate army service abroad of less than six months have been adopted by the War Department. Every officer, field clerk or enlisted man recalled from France prior to the completion of the half-year service, which would permit him to wear a gold chevron, will be authorized to wear a chevron of "sky blue cloth."

Huge Sirens to Warn City of Air Raids

Definite plans for installing warning sirens to notify the city in case of air raids have been completed by the Police Department, and the work of placing the big sentinels has begun. Two sirens have been placed in Brooklyn and it is planned to place a large number in New York.

Each siren, which will have a carrying power of from two to three miles, will be placed on an Edison plant. The authorities consider this will be more efficacious than installing them at random, for under the present plan one organization will have control of them all. The sirens will be connected by an electrical switch which will make it possible to sound them all at the same time.

Lieut. Keogh Honored

Lieut. Grenville Temple Keogh, of the French Aviation Corps, who is at the home of his parents, Supreme Court Justice and Mrs. Martin J. Keogh, in New Rochelle, has received a bronze statue of a minute man from his friends and neighbors.

The affair was arranged by Columbus O'Donnell Iselin, who had the statue made. It is a reproduction of the figure of the minute-man monument at Concord.

Americans in R. A. F.

The Americans attached to the British air force are doing excellent work. A British staff officer, speaking with the corresponding, was high in his praise of their deeds. They are not only most able, he said, but they are congenial associates. The British have been delighted at the type of men who have come to them, and the relations between the Allies are eminently cordial.

Weather Conditions In America Cabled to Europe

Washington, D. C.—Even the weather in the United States is being watched from the western battle front in France. Like other events over here, such as the mobilization of man power and the conservation of food, the weather in the United States may vitally affect operations on the "frontiers of freedom."

Once every twenty-four hours a summary of weather conditions in the United States is cabled to officers of the Army who formerly were officials of the United States Weather Bureau.

The reason is that marked conditions of the weather in this hemisphere are likely to be reflected in the other, and the reason for that is the trend of the atmosphere toward the East. As the world revolves from east to west the atmosphere in mid latitudes tends to move constantly toward the rising sun. A great storm in this country may have its counterpart in greater or less degree in Europe some days later. Fair weather on this side may mean fair weather over there within a week. Supplied with this, in addition to local information, the "officers of the weather over there" are aided in forecasting conditions favorable for aeroplane activity, artillery work, or other military operations.

Trapshooting for Cadets

Trapshooting has been started for the benefit of the cadets at all aviation schools. The Government thus officially recognizes the value of a knowledge of trapshooting to the men who are training for this branch of the service. The most important part of their work will be shooting at a moving target, and trapshooting is designed to develop their skill in this direction.

Special Aviation Courses

A number of commissioned officers of the Aviation Section, Signal Corps, have just completed special courses in compass adjustment and air navigation. The Department of Military Aeronautics recently organized a school at Camp Dick, Dallas, Texas, for this advance instruction. The two courses were conducted at the same time and completed in two weeks. The two British officers who were the instructors have expressed themselves as pleased with the results accomplished and the spirit of the men. Capt. S. T. Fripp, Royal Air Force, was in charge of the compass classes. This course was designed to give engineer officers special instruction in the adjustment and compensation of aeroplane compasses. Those instruments get out of order because of the local magnetic fields set up by magnetos and engines, and from the jarring due to rough landings. The students who took this course were selected from graduates of the engineering ground officers' school at Massachusetts Institute of Technology. The course in navigation was conducted by Naval Instructor W. T. Farr, R.A.F. It consisted in instruction in air navigation, or flying by dead reckoning, the method of flying followed when the ground is not in view. Each of the flying schools in this country was represented in this course by an officers who had had charge of cross-country flying. The officers who finished this training will now return to their respective flying fields to instruct cadets in the subject.

Marooned In Hawaii

Military and civilian circles at Hilo, Hawaii, are rejoicing over the return in safety, from a two nights and a day exposure to the perils of the woods, of Major Harold M. Clark, Signal Corps, U.S.A., and his mechanician, Sergt. Robert P. Gray. They were lost in the clouds, after an aeroplane flight, and were forced to travel inland, where darkness compelled them to make a landing under perilous conditions. Without food they managed to exist two days, until after a struggle through the jungles, they finally found a way to the open and thence to one of the patrol stations. During their midnight flight, Major Clark managed, by skillful manipulation of his machine, to save both his own life and that of Sergeant Gray and to make a landing without accident to either.

Flew to Canada

Montreal, June 6.—Lieut. Georges C. Flachaire, the French ace, completed a flight from Washington, D. C., when he landed here last night. He started from Washington yesterday morning, and his route was via Buffalo, Toronto, and Brockville. The flight was undertaken in the interests of the bazaar opening here to-day for the aid of France.

Lieut. Lawrence Killed in Action

Lieut. Edgar Allen Lawrence, a member of the Aviation Corps, has been killed in action on the western front. He was a native of Chicago, twenty-four years old, and a graduate of the University of Illinois. Last September he enlisted and was sent to Toronto, Canada, for training. Then he returned to Fort Wood in New York harbor. Later he was sent to the aviation camp at Fort Worth, Tex., and last March went overseas.

THE PERSONAL DIARY OF LIEUT. ALAN F. WINSLOW

THE following personal diary of Lieut. Alan F. Winslow, Aviation Section Signal Reserve Corps, of Chicago, the first American aviator of the American Expeditionary Forces to bring down a German plane, is made public by the War Department. It was not written for publication, but is given out on account of its historical and descriptive value:

On Sunday morning, April 14th, I was "on alert" from 6:00 A. M. till 10:00 A. M., that is, I, with Lt. Douglas Campbell of Harvard and California (since designated as the first American "Ace") were on emergency call duty. We were sitting in the little alert tent, playing cards, waiting for a call. Our machines were outside, ready at a moment's notice. I was patrol leader. At 8:45 I was called to the 'phone, told by the information officer, who is in direct touch with all batteries and observation posts, that two German aeroplanes were about two thousand meters above the city, which is only a mile or so from here. We were told they were going east. We were rushed down to our machines in side cars, and in another minute were off in the air.

"Doug" started ahead of me, as I was to meet him above in a certain point at five hundred meters, and then take the lead. I gave him about forty-five seconds' start, and then left myself, climbing steeply in a left-hand spiral in order to save time. I had not made a complete half turn, and was at about two hundred and fifty meters, when straight above and ahead of me in the mist of the early morning, and not more than a hundred yards away, I saw a plane coming toward me with huge black crosses on its wings and tail. I was so furious to see a Hun directly over our Aviation field that I swore out loud and violently opened fire. At the same time, to avoid my bullets, he slipped into a left-hand reversement, and came down, firing on me. I climbed, however, in a right-hand spiral, and slipped off, coming down directly behind him and "on his tail." Again I violently opened fire. I had him at a rare advantage, which was due to the greater speed and maneuverability of our wonderful machines. I fired twenty to thirty rounds at him and could see my tracers entering his machine. Then, in another moment, his plane went straight down in an uncontrolled nose-dive—I had put his engine out of commission. I followed in a straight dive, firing all the way. At about six feet above the ground he tried to regain control of his machine, but could not, and he crashed to earth. I darted down near him, made a sharp turn by the wreck, to make sure he was out of commission, then made a victorious swoop down over him, and climbed up again to see if "Doug" needed any help with the other Hun:—for I had caught a glimpse of their combat out of the corner of my eye.

I rose to about three hundred again, to see "Doug" "on the tail" of his Boche. His tracer bullets were passing throughout the enemy plane. I climbed a little higher, and was diving down on this second Hun, and about to fire, when I saw the German plane go up in flames and crash to earth. "Doug" had sent his Hun plane down one minute after I had shot down mine.

Mind you, the fight took place only three hundred meters up, in full view of all on the ground and in the near-by town; and it took place directly above our Aviation field. Futhermore, mine dropped about one hundred yards to the right, and "Doug's" one hundred yards to the left of our field. These are remarkable facts, for one of our Majors, who, with the French army since 1915, has shot down seventeen machines, never had one land in France—and here we go, right off the bat and stage a fight over our aerodrome and bring down two Huns right on it. It was an opportunity of a lifetime—a great chance.

When we landed, only our respective mechanics were left in the "drome," to help us out of our flying clothes. The whole camp was pouring out, flying by on foot, bicycles, side cars, automobiles; soldiers, women, children, majors, colonels, French and American—all poured out of the city. In ten minutes several thousand people must have gathered. "Doug" and I congratulated each other, and my mechanic, no longer military, jumping up and down, waving his hat, pounded me on the back instead of saluting, and yelled: "Damn it! That's the stuff, old kid!" Then Campbell and I rushed to our respective Hun wrecks.

On the way there—it was only half a mile, I ran into a huge crowd of soldiers—blue and khaki—pressing about one man. I pushed my way through the crowd, and heard somebody triumphantly say to the surrounded man in French: "There he is; now you will believe he is an American." I looked at the man—a scrawny, poorly clad, little devil, dressed in a rotten German uniform. It was the Hun pilot of the machine I had shot down. Needless to say, I felt rather haughty to come face to face with my victim, now a prisoner, but did not know what to say. It seems he would not believe that an American officer had brought him down. He looked me all over, and then asked me in good French if I was an American. When I answered, "Yes," he had no more to say.

There was a huge crowd around the wrecked plane, and the first man I ran into was our major—the commanding officer,—and he was the happiest man in the world outside of me and "Doug." A French and an American General blew up in a limousine to congratulate us—colonels, majors, all the pilots, all the French officers, mechanics,—everybody in the town and camp. All had seen the fight. One woman, an innkeeper, told me she could sleep well from now on, and held up her baby for me to kiss. I looked at the baby, and then felt grateful to my major, who pulled me away in the nick of time. I had my mechanics take off everything available—the machine was a wreck—but I got some splendid souvenirs. The big black German crosses from the wings, his rudder, pieces of canvas with holes from bullets in them, all his spark plugs, his magnetos, his mirror, clock, compass, altimeter, his clumsy signal revolver, etc.—it is a great collection.

"Doug" had set his Hun machine on fire at three hundred meters, and it had fallen in flames, rolling over three times, and then completely burning up. There remained but a charred wreckage, like the sacrifice of some huge animal. The Hun pilot had been thrown out and was badly off. His face, hands, feet, nostrils and lungs were all burnt, while his leg was broken. He is now in the hospital and my Boche is probably commencing his job of ditch digging for the rest of the war.

They got much valuable information from my man—the other couldn't speak. He was a Pole, said he was not an officer because he was a Pole, although he had been an "aspirant" and a pilot at the front for two years. He said to me, with a sort of sigh of relief, throwing up his hands at the same time, "Alors, la guerre est fini pour moi!"

That afternoon my wrecked hun plane and the charred result of "Doug's" good work were exhibited in the public square of the town, surrounded by an armed guard, and overlooked by a French Military band. It also was a great day for the townspeople, and has had a good moral effect. You can imagine it, when you realize it took place above their roof tops, at only three hundred meters, and that they were able to see the whole fight. The Americans are indeed welcome in the town now, and "Doug" and I can buy almost anything half price.

An amusing incident was this: the fight was so near to the earth that bullets were flying dangerously all about the ground. No one was hurt, save a French worker in the field, who received a hole through his ear from one my bullets, and is very proud of it.

Two days later the two aviators were decorated by the French, in an impressive ceremony, with the Croix de Guerre with a Palm, and later were mentioned in General Orders and proposed for the American Distinguished Service Cross.

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Repairing a damaged plane at one of the American Flying fields in France

The AIRCRAFT TRADE REVIEW

Spurs Aeroplane Output

Detroit.—John D. Ryan, Chief of Aeroplane Production, announced June 11, that Detroit manufacturers of aeroplanes and parts, including engines, would be asked to expand.

"I realize," he added, "that this city is already the largest aeroplane producer in the world; that the facilities and the men who know how are here. I have seen some wonderful things here. You have a production of aeroplane engines that is marvelous. It is far ahead of anything of a similar nature produced anywhere else, and, in reality the work is just beginning to get under way.

"Experience has shown that the Government method of doing business won't do," said Mr. Ryan, smiling to take the edge off the remark, "They don't get the results that are desirable and necessary. The only way to do business on the gigantic scale on which it must be done in this war work is to follow the line of business development of the centuries.

"The greatest development undoubtedly will be in the direction of the spruce forests of the West. Timber is the foremost requirement of aeroplane production just now."

Doehler Toledo Plant

The Toledo plant of the Doehler Die Casting Company which is housed in a model factory building completed a little over a year ago, has in this short space outgrown its quarters.

In order to provide for this expansion this company has found it necessary to take over the adjoining plant of the Ohio Electric Co., doubling the present capacity of the plant.

While the greater part of the plant's activities are devoted to Government war work, the needs of the regular trade are receiving the usual attention.

To Stop War Industry Congestion

Washington.—The adoption of a policy designed to reduce the congestion which is playing havoc with fuel and traffic conditions in the northeastern section of the country was announced jointly, June 11th, by the War Industries Board, the United States Fuel Administration and the Railroad Administration.

It has been decided that no further increase in the volume of war orders and the number of establishments handling them in the congested areas will be permitted.

The district affected comprises the New England States, Eastern and Southern New York, Pennsylvania as far west as Williamsport and Altoona, all of New Jersey and Delaware and Eastern Maryland, not including Baltimore.

Notice will be served immediately on the manufacturers engaged in production of war materials in this section that they must hold the volume of their business within certain limitations. The War Industries Board and the other Government agencies involved will be able to regulate the situation through Governmental control of the allocation of raw material, fuel and transportation facilities.

Government Leaves Little Steel for Non-Essentials

The agreement reached by the War Industries Board and the American Iron & Steel Institute, by the terms of which the Government takes over absolute control of distribution of all manufactured products and pig iron, indicates that there will be little, if any, steel for non-essential industries during the remainder of the year. Whatever surplus production there may be, Chairman Bernard M. Baruch said, will be equitably distributed among the industries not engaged in war work. As the Government has placed orders aggregating approximately 18,000,000 tons or more than one-half the capacity for the last six months of this year, it is evident that companies not engaged in war work will get a small percentage only of their requirements.

The essential industries are classified as follows: Ships, including destroyers and submarine chasers. Aircraft. Munitions, military and naval supplies and operations; building construction for Government, etc. Fuel; domestic consumption, manufacturing necessities, etc. Food and collateral industries. Clothing. Railroads. Public utilities.

The Government will do all in its power to increase steel and iron production.

The Continental Aircraft Company's New Factory

The new factory of the Continental Aircraft Company is situated at Amityville, Long Island. It is a modern structure on the outskirts of the town with a large flying and testing field adjoining. The company has installed the most modern machinery for the rapid manufacture of aircraft, and expect to get into quantity production in the near future.

At the present time the company is working on a type of battleplane and a small speed scout. These will soon be completed and ready for testing.

Mr. V. Buranelli is the chief designer of the firm which at present employs about two hundred men.

Maximum Aluminum Price 33 Cents

Washington.—The new maximum base price of aluminum from June 1, 1918, to September 1, 1918, has been set at 33 cents per pound, f. o. b. the United States producing plants, for 50 tons or over, of ingot of 98 to 99 per cent. This has been made by the War Industries Board and approved by the President, following co-operative investigations between the board and the Federal Trade Commission.

Personal Pars

Middletown, Conn.—Harold T. Woodley, of Great Necy Station, N. Y., who captained the football team at Wesleyan last autumn, has left college to become a naval aviator.

Pressed and Welded Steel Products Company, Inc., to Enlarge

The Pressed & Welded Steel Products Company, Inc., who have produced a large number and variety of Exhaust Headers and other part for Aeroplanes, will move into new and larger quarters, with increased facilities, in Long Island City, about July 1st.

Aircraft Organization in France

The shortage of training machines for the American Air Service students is disappearing and the ground work will be perfected for American air work on a large scale in the very near future. There are large production departments which are really huge assembling and testing centers, flying schools of huge proportions, repair shops and supply centers, all on the same big scale.

Already there are men on hand, plenty of them, to fill all these as soon as engines, parts and necessary materials arrive in volume, as they will very soon. It will not take long then for the original air program to materialize.

An inspection of several of these flying schools will show that the flying done there is well up to the standard of the British and French fliers.

No Cut for Aero Plants

In connection with the recent announcement of the Fuel Controller that there would be a 75 per cent cut in the allowance of coal to automobile manufacturers it was made very clear that this cut would not affect those firms as far as the manufacture of trucks was concerned. Neither Army truck nor aircraft parts manufacturers will be cut down in the matter of coal.

Cotton for Aeroplane Wings

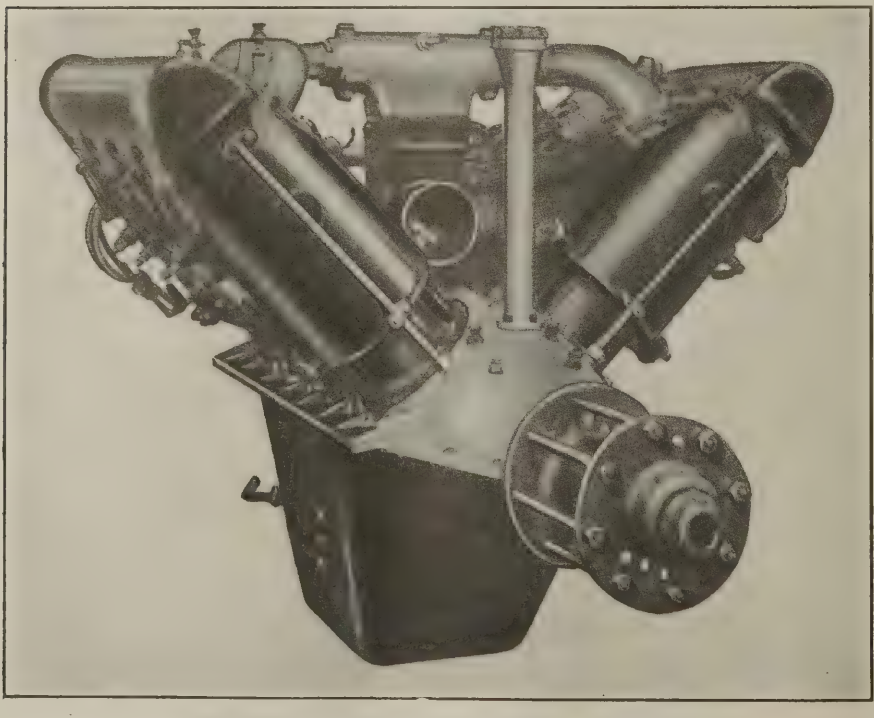
In a paper "The Textile Industry in Relation to th War," which he read before the Spring meeting of the American Society of Mechanical Engineers at Worcester, J. E. Rousmaniere said that until recently it was thought that only linen would do for aeroplane wings. Cotton was thought to be unsuitable because of a marked tendency to expand and contract with variations in the amount of moisture present in the air and also because of a disposition to tear easily when shot through.

Experiments were made with mercerized yarn and they have shown that cotton so treated makes good aeroplane cloth and it is now said that such cloth is standing up as well as linen. Battleplane wings are still covered with linen, but cotton is used on practice and bombing planes.

When first tried out there was a feeling among aviators that they were not getting such good machines in the cotton wing aeroplanes, and they manifested some hesitancy about using them. A little actual experience in flying, however, soon demonstrated that the cotton wings are entirely satisfactory and this feeling on the part of the aviators is said to have entirely disappeared.

To Investigate New Gasoline Process

Washington.—A resolution introduced in the House of Representatives June 6 calls for an investigation by the Committee on Standards,



A Hispano-Suiza aero engine constructed in a French factory

Weights and Measures of a new process of extracting gasoline and other motor fuel from petroleum and fuel oil. The process is the discovery of S. N. Herber, St. Joseph, Mo., who says that he can extract the gasoline in greatly increased quantities and at much less than the present cost.

Personal Pars

H. G. MacEachen, Pacific Coast advertising representative of the Firestone Tire & Rubber Co., Akron, has resigned to join the United States Army.

Julian S. Friede, for the last two years in the engineering department of the Paige-Detroit Motor Car Co., has enlisted in the Canadian Royal Flying Corps. He will leave shortly for Toronto.

5,304 Miles Covered by Air Mail

Washington.—According to the Post Office Department, the aggregate flying distance covered by the aero mail service between New York and Washington during the second half of May was 5,304 miles, and the average rate of speed, 68 m.p.h.

Garabed Tests Approaching

Washington.—G. T. K. Giragossian, inventor of Garabed, a mysterious natural force, telegraphed the Department of Interior today: "My work excellent, can write definitely Wednesday." Members of the Scientific Test Board, appointed under Congressional resolution, have received word to be ready for the exhibitions.

Gasoline Output

Washington.—During 1917 the United States produced 342,000,000 bbl. of petroleum, equal to 68 per cent of the total world production. This is 3 per cent higher than the percentage for 1916, the largest percentage since 1875 and the largest total production in the history of the country.

Russia comes second in petroleum with a total of 65,000,000 bbl., which is only 18 per cent of the amount produced by the United States. Mexico is third with 55,293,000 bbl. Other countries produce so small an amount in comparison that they are practically negligible.

Production of oil during March reached a high mark. Crude oil was produced at the rate of 846,441 bbl. a day, as compared with a daily average of 815,330 bbl. in March, 1917. The total of gasoline was 269,627,968 gallons, or a daily average of 8,697,676 gallons. This is 50 per cent greater than the daily average for March, 1917. Production of kerosene also increased, but not in as large a ratio as gasoline.

Stocks on hand at the refineries on March 31 were far greater than the amount on Dec. 31. At the end of 1917 there were 412,256,833 gallons of gasoline stord away, and on March 31 this was increased to 526,382,386. Crude oil on March 31 was 13,122,241, as compared with 11,638,433 gallons stored away on Dec. 31.

Use Browning Machine Guns for Aircraft

Washington.—The Browning machine gun has undergone tests made to determine its value for use on aeroplanes, according to the War Department. The gun functioned perfectly, reports state, and as a result of the tests, the heavy type gun with the outer jacket removed will be used for aircraft.

The official announcement says:

"This is one of three types of machine guns with which the rate of fire can be so synchronized with the revolutions of the propeller of a tractor aeroplane that the gun can be fired by the pilot of a combat plane through the revolving blades. Firing in that fashion, it is necessary to aim the machine gun by steering the plane directly at the target. The direction of the plane gives direction to the fire and the pilot can fire the machine gun while controlling the plane.

"Aeroplane propellers revolve at from 600 to 2,000 revolutions per minute. The machine gun is connected with the aeroplane engine by a mechanical or hydraulic device, and impulses from the crankshaft are transmitted to the machine gun. The rate of fire of the machine gun is constant and its fire is synchronized with the revolving propeller blades by "wasting" a certain percentage of the impulses it receives from the aeroplane engine and by having the remaining impulses trip or pull the trigger so that the gun fires just at the fraction of the second when the propeller blades are clear of the line of fire.

"The pilot operates the gun by means of a lever which controls the circuit and allows the impulses to trip the trigger.

"The test given the Browning gun was severe. A gun was mounted on the frame of an American combat plane and connected with the aeroplane engine. The test was conducted on the ground and in place of the propeller a metal disc was attached to the crankshaft. The browning gun was then required to register hits on the metal disc as it revolved at verying speeds from 400 to 2,000 revolutions per minute. The slightest "hang fire" or delay in action on the part of the gun would have been shown by the failure of the bullets to hit precisely on the spot on the disc representing the center of the zone of fire. The gun functioned perfectly.

"The Browning gun to be used with aircraft is the heavy type with the water jacket removed.

"Besides the Browning, the United States will also employ the Marlin aircraft gun as a synchronized weapon. Several thousand of these have been manufactured and the gun is in quantity production.

"The British and French use the Vickers as a synchronized machine gun.

"The Lewis aircraft machine gun is used by the British, French and American forces, but for a different purpose. In a two-seater combat plane, fixed machine guns are mounted forward to be operated by the pilot and flexible guns are mounted to be operated by the observer in the rear seat of the plane. The observer operates Lewis guns on flexible mounts, firing to right or left of the plane.

"It is of vital importance to have absolute reliability of function in a synchronized machine gun on tractor aeroplanes. Delays in fire or malfunctions due to faulty construction or imperfect ammunition causes bullets to strike the propeller blades. As many as fifteen bullets have been known to strike a propeller blade without causing an aeroplane to fall, but the danger of such occurrences is nevertheless obvious. For that reason, every effort is made to provide the most perfect type of weapon for this work. Only specially selected ammunition is used.

Windows Protected from Air Raid Bombs

Paper strips, pasted in curious geometrical designs on a large show window on the Broadway side of the John Wanamaker store, attracted a crowd of curious persons yesterday. A note in the window explained they were pasted to hold the glass together in case air raiders drop bombs in the vicinity. The strips, one and a quarter inch wide, covered the show window of the furnishings department in the new building, but did not obscure an interesting display.

The John Wanamaker decorators have adapted a French idea. New York stores probably will follow the lead of most of the Paris stores.

The assembly room of the aeronautic department of the Fiat plant at Turin, Italy. Italian Official Photo.

THE AUSTRIAN BERG SINGLE-SEATER FIGHTER

SIMPLICITY would appear to be the keynote of design in the Austrian Berg single-seater fighter, both as regards mass, or aerodynamic, design and structural design. The machine has every appearance of being designed chiefly with a view to rapidity of production, yet this object has been attained by a studied simplicity of detail rather than by any scimping in workmanship. In fact, although the finish is not, perhaps, as good as on some machines, the workmanship appears everywhere to be really quite good, and the materials employed in the construction are, if anything, better than found on a good many German machines. Whether this is due to a more plentiful supply of the right materials in Austria than in Germany, or whether Austrian inspection is stricter than that obtaining in Germany, is difficult to say, and one can only call attention to the fact without venturing an explanation.

Fundamentally the Austrian Berg is of the single-seater fighter type in which the pilot and top plane are so placed in relation to each other that the wing obstructs the view to a very small extent only. This has been accomplished, not so much by reducing the gap to a smaller proportion of the chord than usual, as by making the body very deep and placing the pilot fairly high inside the body. On closer examination it is found that the extra depth of the body is provided by deepening the turtle back, which forms a much greater proportion of the overall depth than is the case in most machines.

The body proper, which is of the flat-sided variety, is constructed on similar lines to those of the older models of Albatros biplanes, *i.e.,* of *longerons* and struts of fairly small section, the whole being covered with three-ply wood. As distinct from the Albatros, however, there are only four *longerons,* the auxiliary rails halfway up the sides of the latter having evidently been deemed unnecessary by the designer of the Berg. The turtle back, which is different from the majority in that it does not, except in front, cover the whole width of the flat top of the body, but comes to a point just in front of the vertical fin, is of a peculiar section. This may, in the absence of a sketch, best be described by saying that it consists of three curvatures, a convex at the top, a concave halfway down, and again a convex at the bottom. The object, evidently, is to provide stream lining of the pilot's head by having the turtle back deep without, however, obstructing the view to too great an extent by having it very wide. Roughly the configuration is that of a man's head and shoulders.

The pilot's cockpit is very comfortable, the deep top efficiently screening his face while at the same time, owing to the peculiar outline, not obstructing the view to as great an extent as one would imagine. By leaning his head slightly the pilot can easily look past the nose of the machine, so that there is really no "blind" spot beyond a few yards ahead of the machine. The fact that the chord line of the upper wing if projected passes through the pilot's line of vision renders the view forward and upward particularly good. Small circular windows are inserted in the turtle back in front of the pilot, but it appears that the view obtainable through these is of very little practical utility, and the inference is that they are placed there to admit light on to the instrument board rather than to provide direct vision.

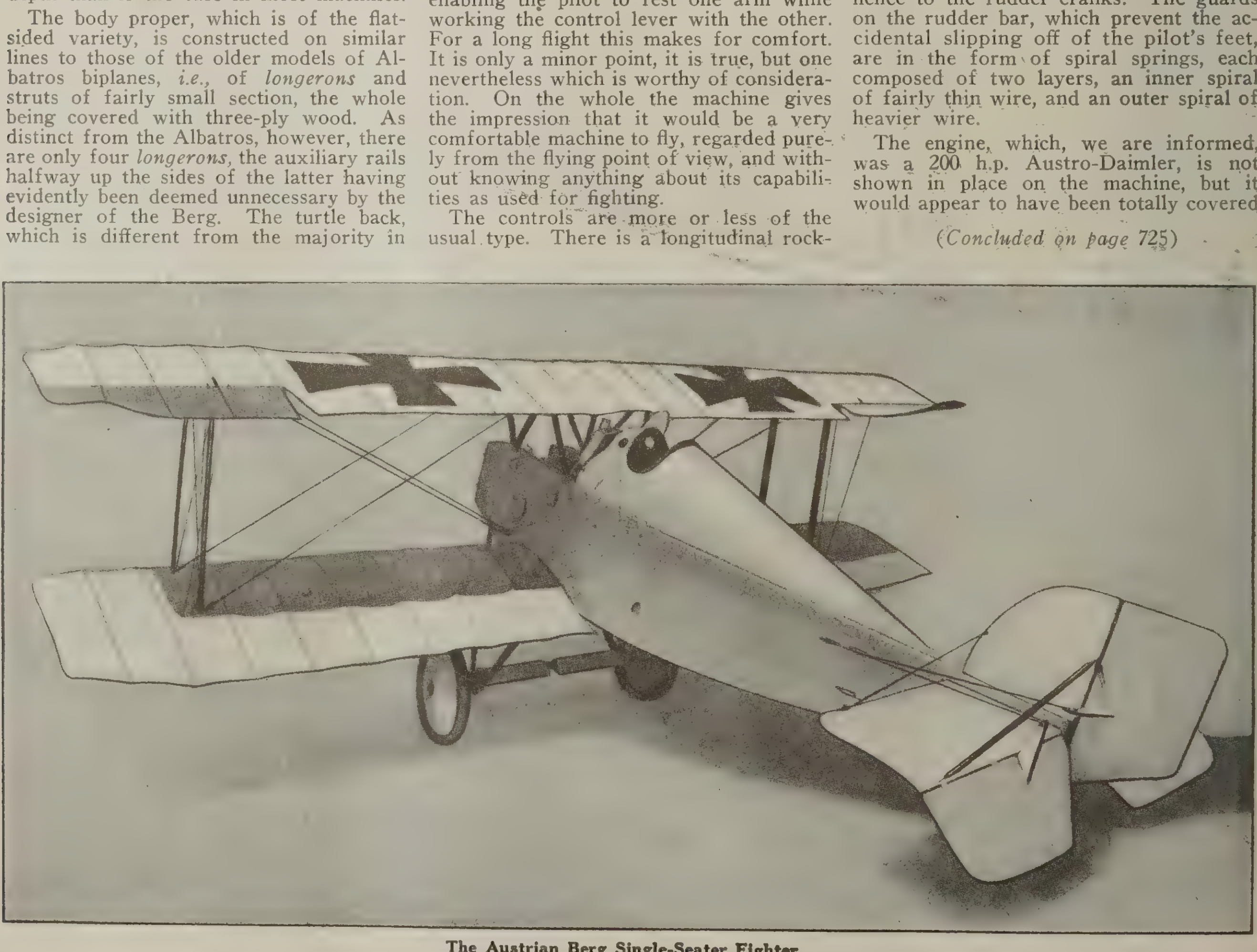
The pilot's seat is extremely comfortable, and is provided with arm rests, thus enabling the pilot to rest one arm while working the control lever with the other. For a long flight this makes for comfort. It is only a minor point, it is true, but one nevertheless which is worthy of consideration. On the whole the machine gives the impression that it would be a very comfortable machine to fly, regarded purely from the flying point of view, and without knowing anything about its capabilities as used for fighting.

The controls are more or less of the usual type. There is a longitudinal rocking shaft, mounted rather higher above the floor boards than is generally the case. The control lever is forked around this shaft, and is free to oscillate forward and backward for operating the elevator. A short length of cable passes from the lower end of the "joystick" to a point on the floor boards. This limits the extent to which the lower end of the lever can move back, and has the effect of preventing, when on the ground, the elevators from touching and getting damaged. In connection with the lateral controls, the wing flaps are fitted with cranks resting in slots in the planes, and there is a somewhat unusual arrangement whereby the *positive* cable is taken to the front arm of the crank, so that it is the return cable which pulls the wing flap down. The reason for this may be found in the warped wing flap, which may conceivably have its outer tip tilted upwards to such an extent that the effect of moving the flaps is to put a force acting downward on the flap moved upwards before the flap on the opposite side, which has, of course, been moved down simultaneously, receives an upward force. To bring this peculiar action about the crank on the rocking shaft points downwards instead of, as is more usually the case, pointing upwards.

The foot bar operating the rudder is of the T type. That is to say, the rudder control cables are attached to a crank arm projecting forward at right angles to the foot bar. The cables are then taken around pulleys near the side of the body, and hence to the rudder cranks. The guards on the rudder bar, which prevent the accidental slipping off of the pilot's feet, are in the form of spiral springs, each composed of two layers, an inner spiral of fairly thin wire, and an outer spiral of heavier wire.

The engine, which, we are informed, was a 200 h.p. Austro-Daimler, is not shown in place on the machine, but it would appear to have been totally covered

(Concluded on page 725)

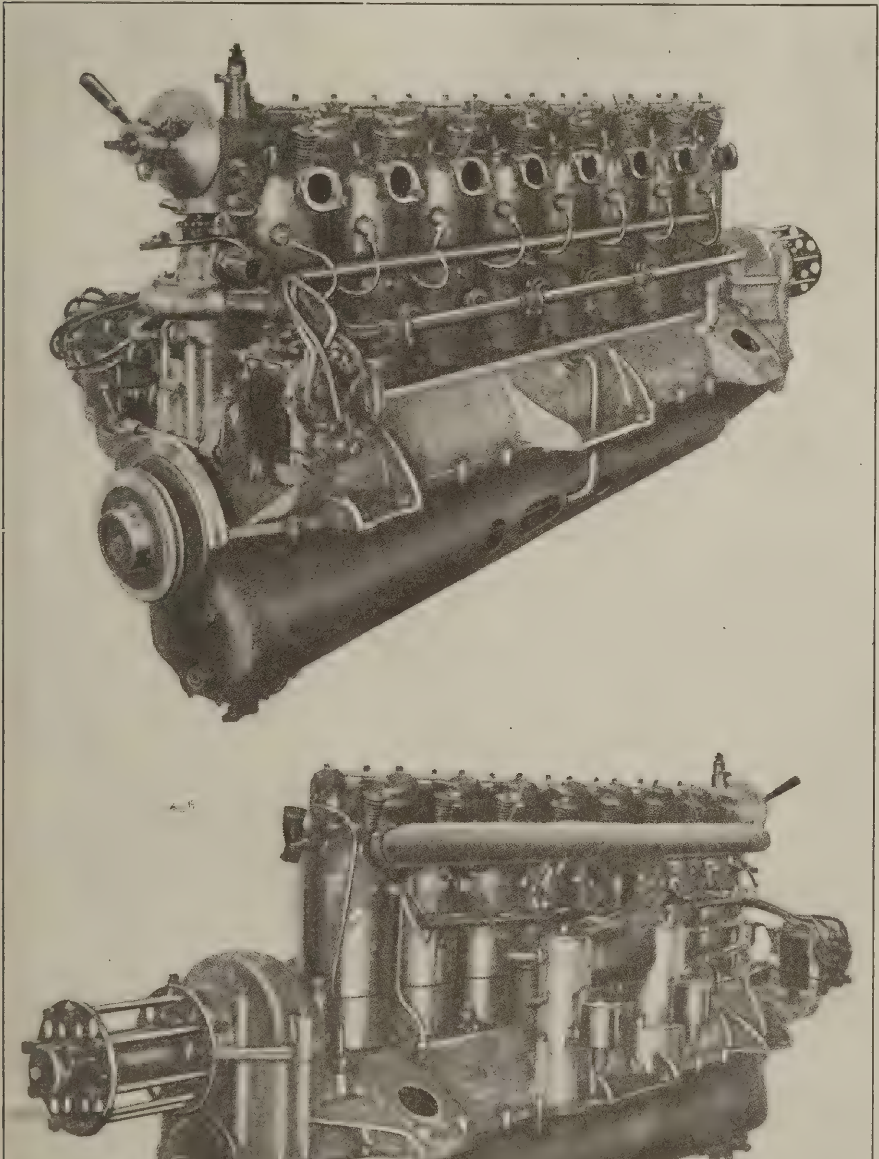


The Austrian Berg Single-Seater Fighter

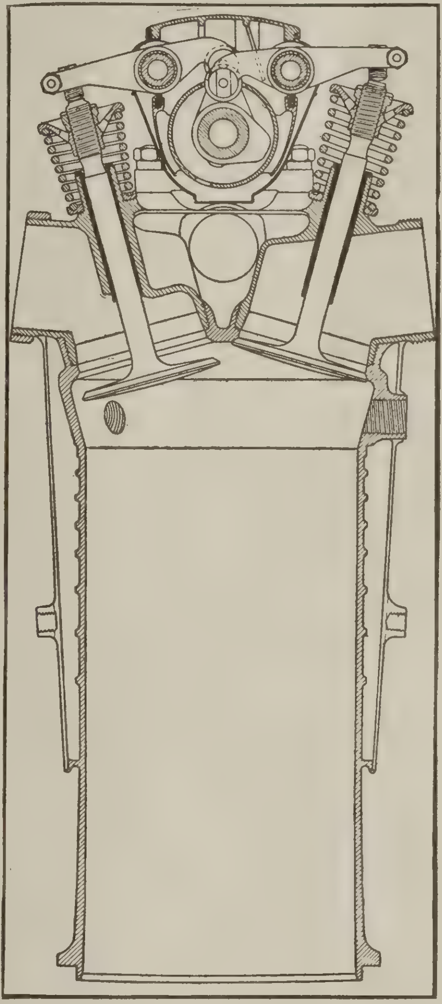
THE 240 H.P. (8-Cylinder) MERCEDES

THE following detailed report on the design of the 8-cylinder Mercedes engine is based on an investigation of the engine (No. 23,003) taken from the German two-seater Albatross Biplane (G.37) which was brought down by anti-aircraft guns near Armentières on May 12th, 1917. This engine has been tested at the Royal Aircraft Factory and results of B.H.P. developed, petrol and oil consumption, etc., during tests are given herewith, together with details of the engine design and the leading particulars of the engine. Although this engine, according to reports, is now obsolete, the design having been abandoned in favor of the German standard six-cylinder vertical type, details and illustrations of the engine will no doubt prove of considerable interest, more particularly to those interested in the design of the special engines used for airship work.

In its general details this engine follows closely the design of the 160 H.P. Mercedes engines as regards the construction of the cylinders, pistons, valve gear, etc., and also in the lubrication system. It is therefore very similar to the 160 H.P. engine, with an extra pair of standard cylinders and a massive propeller shaft reduction gear, and the necessary alterations to the design of the crankshaft and the induction system, and in consequence of this similarity in detail to the 160 H.P. Mercedes, it will be unnecessary to deal at any length in this report with the design of those parts of the engine which are identical, a report on the former having already been issued, and the design being now well known in this country.



The 240-H.P. Mercedes Motor



The Mercedes Cylinder

Engine Data

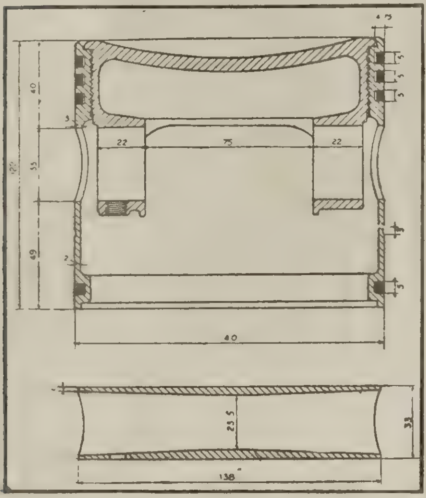
Number and arrangement of cylinders, eight, vertical, separate; bore, 5.51 ins. = 140 mms.; stroke 6.30 ins. = 160 mms.; stroke/bore ratio, 1.142:1; area of one piston, 23.84 sq. ins. = 153.9 sq. cms.; total piston area of engine, 190.83 sq. ins. = 1231 sq. cms.; stroke volume of one cylinder, 150.28 cu. ins. = 2463 cu. cms.; total stroke volume of engine, 1202.24 cu. ins. = 19704 cu. cms.; volume of clearance space, 40.30 cu. ins. = 660 cu. cms.; compression ratio. Total volume/Clearance volume, 4.73:1.

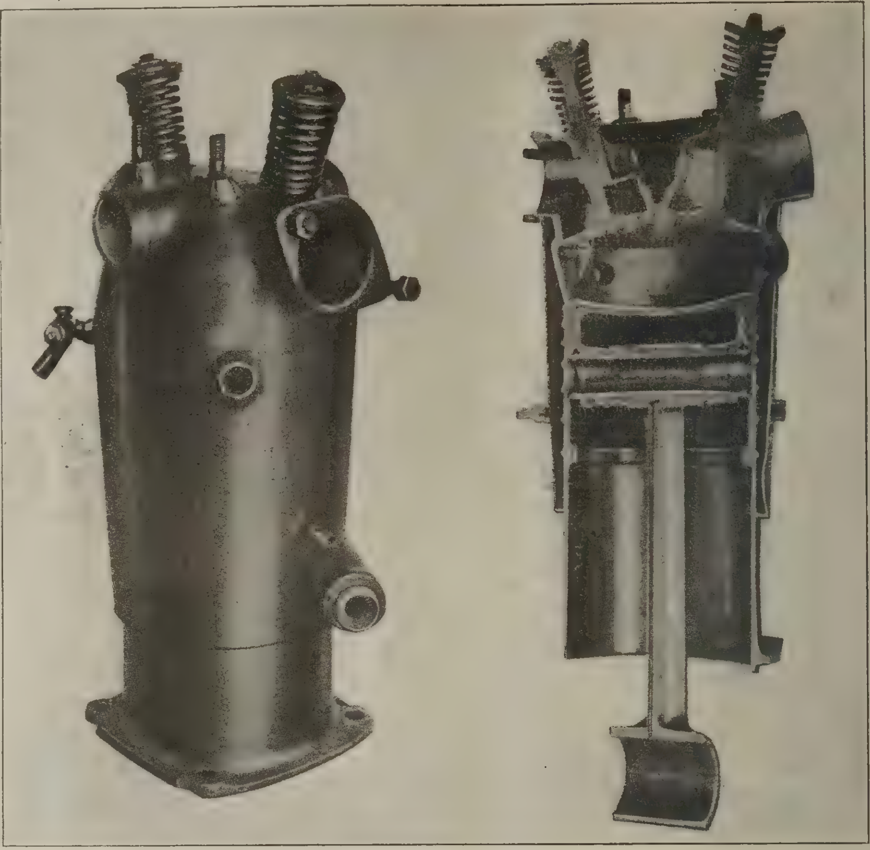
Max. B.H.P. and speed, 287 B.H.P. at 1750 r.p.m.; normal B.H.P. and speed, 242 B.H.P. at 1350 r.p.m.; piston speed at normal speed, 1418 ft. per min.; brake mean pressure at normal speed, 118 lbs. sq. in.; cu. ins. of stroke volume per B.H.P., 4.97 cu. ins.; sq. ins. of piston area per B.H.P., 0.788 sq. in.; B.H.P. per cu. ft. of stroke volume, 348.0; B.H.P. per sq. ft. of piston area, 182.7.

Direction of rotation of crank, anti-clockwise, facing propeller; direction of rotation of propeller, left hand tractor; normal speed of propeller, 977 r.p.m.; ratio of crankshaft speed to propeller speed, 1.382:1; type of gear reduction to propeller, Spur gear.

Lubrication system, forced, multiple plunger pumps; oil temperature, 37.5° C. (test figures); oil consumption per hour, 10.16 pints = 11.43 lbs.; oil consumption per B.H.P. hour, 0.042 int = 0.047 lb.; specific gravity of oil, 0.900.

Type of carburetors, Two, Mercedes, twin-jet; diameter of chokes, 0.945 in. = 24 mms.; bore of main jets, 0.078 in. = 2 mms.; bore of pilot jets 0.0197 in. = 0.5 mms.; fuel consumption per hour, 141.3 pints = 127.1 lbs.; fuel consumption per B.H.P. hour, 0.582 pint = 0.524 lb.; specific gravity of fuel, 0.720; inside diameter of induction pipes, 2.125 ins. = 54 mms.





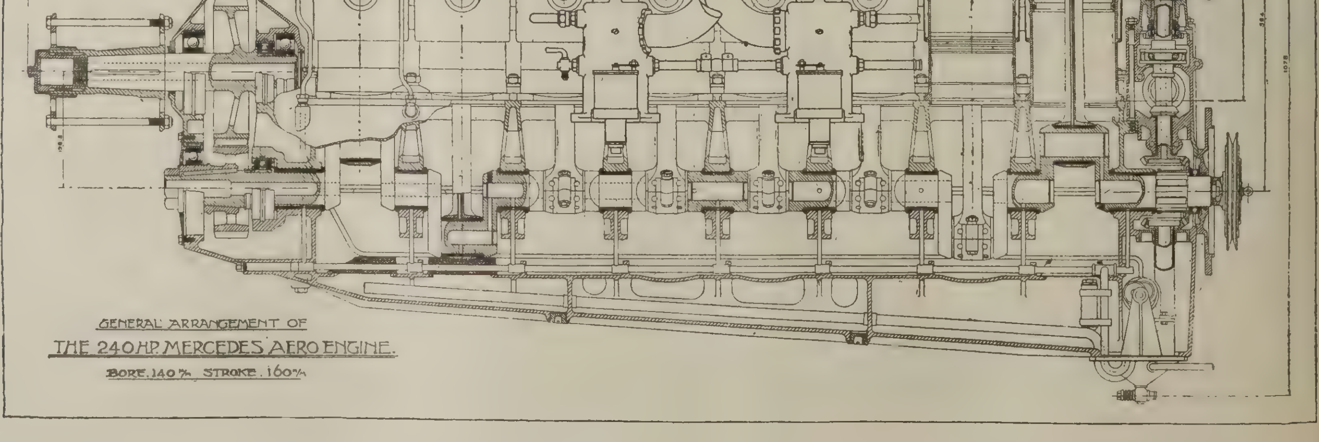
The cylinder construction of the Mercedes motor

Type of magnetos, two Bosch, H.L.8; firing sequence of engine, propeller, 1-3-2-4-8-6-7-5; speed of magnetos, engine speed; magneto timing (degrees early full advance), 30° early.

Inlet vale opens. Degrees on crank, 2° late; inlet valve closes. Degrees on crank, 51° late; diameter of inlet valve (smallest diam.) = *d*, 2.677 ins. = 68 mms.; lift of inlet valve = *h*, 0.450 in. = 11.4 mms.; area of inlet valve opening ($\pi\ d\ h$), 3.780 sq. ins. = 24.40 sq. cms.; mean gas velocity through inlet valve at normal speed, 149.5 ft. per sec.; clearance of inlet tappet, 0.012 in. = 0.305 mm.

Exhaust valve opens. Degrees on crank, 52° early; exhaust valve closes. Degrees on crank, 16.5° late; diameter of exhaust valve (smallest diam.) = *d*, 2.677 ins. = 68 mms.; lift of exhaust valve = *h* 0.412 in. = 10.48 mms.; area of exhaust valve opening ($\pi\ d\ h$), 3.460 sq. ins. = 22.4 sq. cms.; clearance of exhaust tappet, 0.018 in. = 0.457 mm.

Weight of engine complete, without water, fuel or oil, 900 lbs. (including exh. manifold and propeller hub); weight per B.H.P., 900/242. 3.72 lbs. per B.H.P.;


GENERAL ARRANGEMENT OF
THE 240 HP. MERCEDES AERO ENGINE.
BORE. 140 m/m STROKE. 160 m/m

weight of exhaust manifold, 19.5 lbs.; weight of oil carried in engine, 17 pints = 19.13 lbs.; weight of fuel per hour, 127.1 lbs.; weight of oil per hour, 11.44 lbs.; total weight of fuel and oil per hour, 138.5 lbs.; gross weight of engine in running order, less fuel and oil, 1057 lbs. (including cooling system, 242 × 0.65 lbs.) weight per B.H.P., 1057/242. 4.37 lbs. per B.H.P.; gross weight of engine in running order with fuel and oil for six hours, 1971 lbs. (tanks at 10 per cent. of weight of fuel and oil); weight per B.H.P., 1971/242, 8.15 lbs. per B.H.P.

Delivery of water pump at 1350 r.p.m. of engine, 91 galls. per min.; water jacket capacity of one cylinder, 1280 cu. cms.; ratio of water pump speed to crankshaft speed, 1.5:1; water temperature. Inlet, 65° C.; water temperature, outlet, 78° C.; diameter of water pump inlet and outlet, 1.37 ins. = 35 mms.

During calibration tests at the Royal Aircraft Factory, the engine showed a very good general performance, developing a maximum of 286 B.H.P. at 1,750 r.p.m., and an average of 242 B.H.P. at a normal crankshaft speed of 1,350 r.p.m.

Summary of Test

Average petrol consumption per hour	141.3 pints
Average petrol consumption per B.H.P. Hour	.582 pint
Average oil consumption	.042 pint/B.H.P. hour.
Oil temperature	37½° C.
Max. B.M.E.P. at 1,100 r.p.m.	120 lbs./sq. in.
Average B.M.E.P. at 1,350 r.p.m.	118 lbs./sq. in.
Compression ratio	4.73:1.

General Analysis of Weights

Description of Part	No. per set	Average unit weight in lbs.	Weight of complete set in lbs.	Percentage of total weight
Cylinders (bare)	8	19.25	154.00	17.111
Pistons complete with rings and gudgeon pins	8	6.85	54.80	6.088
Connecting rods complete with floating bushes	8	5.00	40.00	4.444
Valves, inlet and exhaust, complete	16	1.312	20.992	2.332
Crankshaft, with floating bevel gear	1	94.50	94.50	10.500
Camshaft and case with half compression gear	1	60.00	60.00	6.666
Reduction gear (large) with propeller shaft and bearings, complete	1	45.00	45.00	5.000
Reduction driving gear on camshaft, complete with bearings and thrust race	1	23.25	23.25	2.583
Base chamber (top half)	1	103.75	103.75	11.527
Base chamber (bottom half)	1	113.00	113.00	12.555
Carburetors, complete	2	8.00	16.00	1.777
Induction pipes, complete	2	7.25	14.50	1.611
Oil pump, complete	1	12.50	12.50	1.388
Water pump, complete	1	9.00	9.00	1.000
Vertical driving shaft, including magneto driving bevels and couplings, &c.	1	12.50	12.875	1.430
Propeller hub, complete	1	17.875	17.875	1.986
Magnetos	2	17.25	34.50	3.822
Ignition wiring, complete	2	2.50	5.00	.555
Exhaust manifold	1	19.5	19.5	2.166
Miscellaneous parts	—	———	48.958	5.439
Total weight of complete engine	—	———	900.00	100

Water pump delivery at normal engine revs. against a pressure of 2 lbs. per sq. in. = 91 galls./min.

The total weight of complete engine, dry, including propeller hub and exhaust manifold = 900 lbs., equivalent to 3.72 lbs. per B.H.P.

An attempt was made to throttle the engine below 900 r.p.m., but the running was irregular.

During a power and consumption run of 1 hour's duration an average of 267 B.H.P. was developed, at an average speed of 1,550 r.p.m., and at an average petrol consumption of 155 pints per hour = .582 pint per B.H.P. hour.

Oil consumption = 10.10 pints per hour = .042 pint per B.H.P. hour.

Water temperature, inlet = 65° C.; outlet = 78° C.

This test should not, however, be taken as representing the normal performance of the engine, as the average speed at which it was run, namely 1,550 r.p.m., is higher than that which would be obtained for any length of time in the air.

Details of Construction

Cylinders.—These, as already stated, are of the standard 160 H.P. type, and are made entirely of steel, being built up of machined steel forgings with the valve pockets screwed and welded into the cylinder-head. The water jackets are of sheet steel, 1.5 mm. gauge, all joints being acetylene-welded in position. The single inlet and exhaust valves are operated by the usual Mercedes type overhead camshaft and valve gear, which is fitted with the well-known half compression gear at the rear end of the camshaft casing. This design of half compression gear is used on all types of Mercedes engines, including the 260 H.P., and the latest 180 H.P. Mercedes engines (a report on which is in preparation, and will be issued shortly).

Pistons.—Standard 160 H.P. pistons are used with concave steel crowns, screwed and welded into the cast iron skirts, which are fitted with three rings above the gudgeon pin and one at the bottom of the skirt.

OFFICIAL SPECIFICATIONS FOR ARMY AEROPLANE LUBRICANT

THIS specification has been approved and adopted by the Ordnance Department, the Quartermaster Corps, the Engineer Corps, the Medical Corps and the Signal Corps, U. S. Army.

General

1. This specification covers the requirements of the U. S. Army in all purchases of oil to be used for the lubrication of stationary cylinder aircraft engines.

2. It is intended to use the name "Liberty Aero Oil" for all oils approved for the lubrication of these engines. On account of differences in characteristics of the high and low specific gravity oils, this specification is drawn to cover both types of oil and to include products manufactured from crude petroleum oils from all fields. For the purposes of this specification, oils are classified as follows:

Classification

3. High specific gravity oils.—This class includes all oils having a specific gravity above 0.9100 (or below 24 deg. Baume conversion by the Tagliabue Manual, 9th Edition, or above 23.85 deg. Baume conversion by the Bureau of Standards' conversion table, Circlar No. 57)—and having a pour test below 15 deg. Fahr. (Tested by the method of the American Society for Testing Materials.)

4. Low specific gravity oils.—This class includes all oils having a specific gravity below 0.9100 (or above 24 deg. Baume conversion by the Tagliabue Manual, 9th Edition, or above 23.85 deg. Baume conversion by the Bureau of Standards' conversion table, Circular No. 57)—and having a pour test 15 deg. Fahr. (Tested by the method of the American Society for Testing Materials.)

Physical Properties and Tests

5. The oil must be made from pure, highly refined petroleum products, and must be suitable in every way for the entire lubrication of stationary cylinder aircraft engines operating under all conditions.

6. The oil must be neutral in action and must not show the presence of moisture, sulphonates, soap, resin or tarry constitutents which would indicate adulteration or lack of proper refining.

7. Viscosity.—The viscosity of the oil, when tested in a Saybolt Universal Viscosimeter at 212 deg Fahr., shall be as follows:

High specific gravity oil, 70 seconds to 75 seconds.

Low specific gravity oil, 85 seconds to 90 seconds.

8. Pour test.—The oil must pass the following pour test:

Hight specific gravity oil, not over 15 deg. Fahr.

Low specific gravity oil, not over 40 deg. Fahr.

9. Flash point.—The oil must have a flash point over 350 deg. Fahr., in a Cleveland open cup.

10. Carbon.—The oil must not show a carbon residue of over 1.5 per cent by the Conradson method. The carbon shown must be loose and flaky and must break up easily in the crucible.

11. Emulsion test.—One ounce of oil shall be placed in a standard four-ounce sample bottle with one ounce of distilled water. The mixture shall be heated to a temperature of 180 deg. Fahr., and then shaken vigorously for five minutes. After standing for one hour, the oil must be clear and of the same color as before the test. All of the water must have settled and appear only slightly cloudy.

12. All tests must be made in accordance with methods adopted by the American Society for Testing Materials.

Statement to Be Submitted by Bidders

13. The bidder must state in his proposal the following characteristics of the oils which he proposes to furnish:

Gravity, Baume, at 60 deg. Fahr.
Flash, Cleveland open cup.
Fire, Cleveland open cup.
Viscosity, Saybolt Universal Viscosimeter, at 100, 130 and 212 deg. Fahr.
Pour test, American Society for Testing Materials' method.
Carbon, Conradson method.
Color, Lovibund.

(*Concluded on page 725*)

STEEL TUBES, TUBE MANIPULATION, AND TUBULAR STRUCTURES FOR AIRCRAFT*

By W. W. HACKETT and A. G. HACKETT, of Oldbury, Birmingham

Introduction

THE present decade will pass down into history notorious for many things good and bad. It will be styled a time of improvement in many ways. It will be remembered as covering the period of the world's greatest war, but it will also be remembered among all trades appertaining in any way to engineering as the age of progress in the manufacture and manipulation of steel tubing.

Independent altogether of the stimulus given to the use of tubing for structural work by the advent and advance of aeronautics, the uses to which tubing of steel and other metals is put has increased considerably during the past few years. Much, of course, has been due to the large output of cycles and motorcycles, but in addition an immense quantity of tubing is used in the construction of motor-cars, and in a thousand other productions which it is unnecessary to particularise in this paper.

The section of tubular work in which we are more especially interested at the moment, however, is that which has relation to aircraft construction, and in this paper we hope to deal with some of the main features of this important subject, giving a brief review of the method of manufacture generally employed, of some of the difficulties that have had to be overcome, and of some of the forms of manipulation which it is possible to put upon good quality steel tubing. The latter part of the paper will deal with tests carried out on specimen tubes, under various conditions, and jointed together in different ways. All that we have to say will apply to seamless steel tubing.

Seamless Steel Tubing

In dealing with such a subject as this, other articles must be brought under review, such, for instance, as lugs and liners, as these enter so largely into the construction of articles built mainly of steel tubing. Mention will be made of cycle and motorcycle experience in the use and abuse of steel tubing.

Seamless steel tubing is a product of modern times, some thirty-five years having passed since the first experiment was successfully carried through. Its commercial production has often made possible the manufacture of articles which could not otherwise have been made, and in other cases it has been the means of popularizing articles which were having a very small sale, and which were even looked upon as freaks. Many present will remember the old bicycles which were built of gas pipes and solid pieces of iron, and will have recollections of the energy taken to propel these machines, especially up an incline! The coming of seamless steel tubing soon altered that, and a few years later cycle frames were being built of light gauge tubing, enabling a man to propel himself at ten to twenty miles an hour on a structure weighing about 30 lbs. Two things made the cycle a commercial success: pneumatic tires, which made riding more comfortable, and light gauge steel tubing, which brought down the weight of the cycle to a minimum. A further word must be said for the pneumatic tires—namely, that by minimizing the shock to the frame made possible the introduction of lighter gauge tubes than could otherwise have been safely used.

How Seamless Steel Tubing is Made

To commence the manufacture of a seamless tube a solid billet of steel, well hammered and rolled, is taken. This billet must be carefully examined for various faults, and any lamination or surface defect removed by chipping, or else the outside of the billet must be turned all over. The usual practice when the latter is done is to turn about ⅜ in. off the diameter of the billet.

Hot-Rolling

The first operation is then to pierce a hole. Two ways of doing this are in general use: one is by means of a hydraulic press, similar to the method of piercing shells so common in this country to-day, and the other by means of a rotary piercing machine. The billet, first centered with large shallow holes, is heated to about 1,200° C. and fed between rolls having a curved outline and set at an angle which imparts a forward movement to the billet as it is rotated. Great pressure is used (which causes the billet to tend to open along its axis), and the billet is forced against and over a pointed mandrel held on the end of a stout rod, which butts against a bracket at a distance of about 7 ft. from the center of the rolls. A billet, 4 ins. diameter by 24 ins. in length, will be made in one operation into a tube about 4 ft. to 5 ft. long. The pierced billet is then taken to another machine which is provided with upper and lower rolls having semi-circular grooves of various radii, and by a series of operations is rolled into a tube of the required size. The tube is passed over mandrels to give the required thickness.

A much quicker process of rolling mild steel tubes is by means of Pilger rolls; but for high carbon steel or chrome nickel steel this process has been found to be unsuitable.

Cold Drawing

The first operation in the cold drawing mills is that of "tagging" the hollow bloom (as the rough rolled tube is called) being reduced at one end by suitable semi-circular tools in a power-forging hammer. The tube in the drawing operations to follow will be pulled through the dies by means of the "tag" thus formed. A small hole is put into the tube at the point where the tag commences, in order to allow acid and water to work through the tube in the subsequent pickling and swilling processes. After being "tagged" the tube is annealed, pickled in a bath of acid to remove the scale, and then swilled in clean water. Following this, the tube is dried and then immersed in a solution of soap, or in oil, to lubricate it for the drawing operation. It is now ready for drawing.

There are two methods of cold drawing in general use. One is by drawing down the outside diameter of the tube upon a long bar of uniform diameter and then passing the tube, while on the bar, through rolls fixed in a "reeling" machine, which is similar to that used in the rotary piercing operation. In carrying out this method the tube is put on to the bar, which must of necessity be smaller than the bore of the tube to be drawn. The tube and the bar are then pulled through a die of hardened steel of such a bore as will give the proper reduction of gauge to the tube. The tube is gripped on the "tag" by means of "dog" jaws sliding on inclined planes. The "dog" is moved along the draw-bench by hooks which are dropped into the links of an endless chain. The chains move at a sped of from 12 ft. to 35 ft. per minute, according to the class of material to be drawn. This process of cold drawing permits of a greater reduction of thickness at each draw than can be obtained by the more usual process of plug drawing, but is rather harsh on the material, and the expand- of the tubing (already hardened by drawing) to allow the mandrel to be extracted sometimes causes splits and fractures. These are more likely to appear if this process is used after the tube has been drawn to a light gauge.

The second method is that known as "plug drawing," and is more usually adopted; in this case a short, hardened mandrel is screwed into one end of a long bar. This bar is screwed at the other end into a larger piece of steel known as the "back sleeve," which is screwed and fitted with a nut at either end. This sleeve has an axial movement of about 9 ins. in the back casting of the draw-bench. The nut at the back is used for the purpose of adjusting the position of the mandrel in relation to the die.

The tube is threaded over the mandrel and the "tag" is passed through the die, which rests against the die plate. Immediately the tube is gripped by the "dog" it commences to move, the mandrel at the same time being drawn forward into position by means of a rope or chain. A reduction in gauge thickness and diameter, with an increase in length, is the result, due to the walls of the tube being drawn down between the mandrel and the die. The usual reduction by this method is about a gauge and a half per draw on low carbon steel. The operation of cold drawing hardens the tube to quite a large extent, and subsequent annealing is necessary.

Annealing

A properly annealed tube showing an ultimate tensile stress of about 30 tons per square inch should give about 38 tons after undergoing the drawing operation. To prepare the tube properly for further cold drawing it is therefore necessary to anneal after every drawing operation, which means it has also to be pickled, washed, dried, and lubricated. A hollow bloom of 1⅞ in. diameter by 8 in. gauge would require nine or ten "draws" to make it into a tube 1¼ in. by 22 in. gauge. The annealing is carried out in suitable muffles, usualy at a temperature of about 600° to 650° C., until before the last "draw," when a temperature of about 850° C. is advisable. In the case of light gauge tubes, this should be done by "close" annealing, as the scaling and blistering of a light tube by "open" annealing would be fatal.

When a tube has been drawn to about 7/16 in. diameter there is great difficulty experienced in drawing on a mandrel. The usual practice is to finish ⅜ in. diameter tubes and smaller by reducing the diameter only, termed "sinking." The condition of the tube finished in this way is not so good as when finished on a mandrel, the strength of the tube being less. From experiments made, tubes from 5 per cent. carbon steel finished by "sinking" show about the same tensile strength as tubes from 35 per cent, carbon steel finished with the usual "draw" on a mandrel.

Chrome Nickel Tubes

The advent of aeroplanes and airships has given rise to a demand for steel tubing of a higher class than before, tubes of high carbon and alloy steels being called for. This has meant careful investigation in order to find the best heat treatment to be accorded in each particular case. The first attempts at drawing chrome nickel steel were scarcely a success, and many breakages of mandrels and even draw-benches resulted from the unsatisfactory annealing of these tubes. Chrome nickel tubes are now being successfully drawn by the same methods as are used for mild steel tubing—by means of "plug drawing"—but very great care needs to be taken in the annealing.

The amount of reduction in gauge per draw is less than half that which is usual in the drawing of mild steel, but in spite of this the wear on mandrels and dies is very great.

A typical analysis of chrome nickel steel is as follows:

Carbon	.3	per	cent
Silicon	.16	"	"
Sulphur	.03	"	"
Phosphorus	.03	"	"
Manganese	.45	"	"
Chromium	1.10	"	"
Nickel	4.00	"	"

Such a steel, when air-hardened, has an ultimate tensile stress of about 100 tons, but a low elastic limit to a maximum value of about 70 tons. Tempering will raise the yield point and at the same time slightly reduce the ultimate stress. This steel is being much used for aeroplane axles. One feature that should be mentioned here is the very serious effect of suphuric or muriatic acid on hardened chrome nickel steel tubing. It has the effect of making the material exceedingly brittle. It is therefore inadvisable to use acid to remove scale from a hardened chrome nickel steel tube; but the injurious effect of the acid can be almost entirely removed by suitable heat treatment.

Acid affects other high tensile steels in the same way, but to a less degree, and has a considerable effect even on mild steel.

Section Tubing

Section tubing has been extensively called for by aeroplane designers, and streamline tubing is used to quite a large extent. The first streamline tube our company (Accles and Pollock, Ltd.) were asked to make was designed by Mr. Howard T. Wright in 1908, and is a section that is very near to the recognized standard of to-day. Section tubing, the streamline-shaped tube especially, is much easier to make if straight sides are avoided, as straight or concave sides compel the use of mandrels and add to the difficulty of production. There are three ways of making sections from seamless tubing—namely, by drawing, rolling and pressing. Pressing is only practicable on fairly short lengths. In drawing there is a slight reduction in periphery in passing from the round, but in rolling or pressing it remains the same.

Some Difficulties Overcome

It will be useful in this paper to review some of the trouble we have met with in connection with other trades where tubing has been used to a great extent, and to mention some of the failures, as the same or similar faults may occur in aeroplane construction. When the Bowden brake was first used on cycles and motorcycles the practice followed was to drill the tube near the handle-bar lug to allow the cable to pass through, and this resulted in a large number of breakages. This difficulty was overcome by drilling the holes through the lugs; but many accidents occurred before this practice was adopted. Under an alternating stress a tube which has been drilled, unless properly reinforced, is very likely to fail. A series of running tests on drilled and undrilled tubes has shown that when stressed up to near its elastic limit the undrilled tubes has in many cases 10 to 20 times the life of the drilled tube. It is often the case that the harder the tube the greater the risk of breakage through a hole. One way of breaking a hard-drawn tube, adopted in tube mills, is either to "nick" the tube on one side with a file or to punch a hole in one side and then break by striking the tube on a block or anvil.

Quite recently we have carried out a large number of important tests on a special type of alternating stress testing machine which we had built. This machine, together with many of the tests carried out and the results achieved, was to a great extent due to the enthusiasm and foresight of Lieutenant-Commander H. N. Wylie, R. N. V. R., and Lieutenant R. W. Fieldwick, the resident A. I. D. Inspector at our works, and to whom we wish to express our thanks for help given.

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*Paper read before the Aeronautical Society on May 2, 1918

Various results of tests carried out on the machine referred to will be given during the course of this paper.

Badly Designed Cycle Lugs

Another series of failures was caused by unsuitable lugs. Some of those used in the earlier days of motorcycling had very strong outlets, and case after case of tube failure occurred. The tubing sometimes broke off so cleanly as to give the appearance of having been cut through. The broken tubing could be flattened, thus proving it was ductile and in a proper condition for its purpose. In order to prove that the fault lay in the excessive strength of the lugs, a series of experiments was carried out a number of years ago. A lug, as generally used, was tapered off at one outlet and left strong at the other. A piece of tubing of the usual gauge and quality was brazed into the lug and the lug firmly secured to a plate. The ends of the two tubes were then moved by eccentrics and connecting rods giving a ½ in. movement at a speed of about .400 alternations per minute. Each time the experiment was tried the tube broke off cleanly close to the thick outlet, whereas the tube at the tapered outlet remained intact.

Another interesting test was as follows: After brazing the tube into a lug with respectively thick and tapered outlets similar weights were applied to the ends. The tube in the tapered outlet bent with an easy curve, but that at the other end bent abruptly close to the thick outlet.

Front Forks for Cycles

It has been proved to the satisfaction of many cycle and motorcycle engineers that to keep on merely increasing the gauge of a tube that appears to be too weak for its work is not always good practice. For instance, take the case of the front fork tube as used on the ordinary cycle. This tube has proved of ample strength for use on the excellent highways of this country, but for Continental roads something better was wanted. Some years ago we supplied a large quantity of front forks produced from 19-gauge tubes to Russian cycle manufacturers. We were asked to increase the thickness to 18-gauge, on account of a number of breakages occurring. We did so, but matters were not improved, and we were then requested to increase further to 17-gauge. There was still no improvement; indeed, the number of breakages increased. The forks all broke off where they were brazed into the crown, and we were asked by the Russian manufacturers to help them out of their trouble. One way of doing this would have been by using a suitable liner or sleeve, but we tried another method, which proved quite successful. We brought brack the gauge of the tubes to 19 where brazed into the crowns and tapered the gauge to 22 at the bottom ends. This proved effective; a lighter article by about 40 per cent., from the same quality steel, thus standing the strain successfully. This result is accounted for by the fact that the shock was more equally distributed along the tubing, due to the strength being reduced gradually, away from the brazed portion, whereas in the plain gauge tubing the whole of the movement was concentrated in a very small space near the crowns.

Tapered Tubes

Tapered tubes could, in our opinion, be used in aeroplane construction to a much greater extent than at present, especially as struts or spars.

Alternating tests as follows were carried out at 400 revolutions per minute on 1-in. by 20-gauge steel tubing, using two parallel lengths and two pieces tapered ½ in. per foot. A weight of 111.56 lbs. was suspended on each tube at a distance of 12¾ ins. from the grips, giving 25 tons stress. The plain pieces broke after 20,585 and 30,390 revolutions respectively, as against 23,557 and 38,225 revolutions respectively by the tapered pieces. The weight of the plain tubes was 6¾ ozs. each and that of the tapered tubes 6¼ ozs. each. In both cases the break on the plain tubes was straighter than on the tapered one.

There are several ways in which to taper a tube. A method much in use is that of swaging, but this is a most unsatisfactory way, as the tube is not kept round whilst being reduced. Swaging tools cannot be quite circular, as a certain amount of "backing off" must be given to them, or the tube will be pinched and crumpled. The continued deforming of the tube during this operation causes it to split if it is much reduced, and the steel is left brittle. Tapering is more successful if done on rolls, as it is then possible to keep the tube round, and the steel is left in a much better condition. In reducing the tube by tapering it is thickened in gauge roughly by about two gauges in a reduction of 50 per cent. of its diameter. A tube of 1⅛ in. by 20-gauge would thicken to 18-gauge if tapered down to 9/16 in. diameter. If uniformity of gauge be aimed at it would be necessary to thin the tubing before the tapering operation. This can be done by drawing. It is even possible to make a tube tapering both in diameter and thickness if such is required.

Tubular Liners or Reinforcements

Considerable attention has been given to the matter of liners as reinforcements to tubes. In cases of trapped or flattened ends of struts a piece of strip steel is often inserted and soldered or riveted into position. This is not good practice, as the tube is not strengthened beyond the point at which it is flattened, and it is well known that, without some additional strengthening, a tube is always weakest at the point where the change of shape begins. If, before flattening, a tubular liner of a gauge equal to about half the thickness of the piece of strip steel is inserted to extend some distance beyond the trapped portion, a much better result is obtained. Various compression tests have been carried out from time to time, and the tubular liner has always proved to be superior.

A liner, however, to be really efficient, should be brazed or soldered to the tube. A series of alternating stress tests has proved to this point. Many liners used in tubular constructional work are not fixed, and consequently do not prevent the tube breaking, but may be sufficient to avoid accidents resulting from such breakages. Take, for instance, a front fork tube on a motorcycle. The liner, often a long one, is put in because this tube has frequently failed at the lugs and serious accidents have occurred, but the position of the liner in the fork makes it very difficult to solder or braze in its place. However, if a fork tube should break the liner will save the situation.

It is not wise to make a liner stronger than the tube it is to reinforce unless the ends of the liner are tapered off gradually or weakened by serrations. When the ends are serrated and the liner is not brazed or soldered into the tube this serrated portion is seldom of any value, as it quickly takes a "set" away from the tube when it has been subjected to a bending stress.

Perhaps the better way to reinforce tubular parts is by means of strengthening "sleeves" brazed or soldered to the outside of the tube. Although in appearance not so neat as when an internal liner is used there is the certainty of being able properly to fix the sleeve in position. A drilled tube 1 in. by 20-gauge was reinforced by a sleeve (in halves) 2½ ins. long by 18-gauge thick, pressed into position over the hole. This tube was subjected to an alternating stress test at 400 revolutions per minute. The sleeve expanded at the ends under the test and gradually became so "bell-mouthed" as to be of little practical use. The tube fractured across the hole at 9,320 revolutions.

Another tube was cut from the same length, similar in all respects, but it had the sleeve soldered in position. This tube did not break until after 43,867 revolutions had been made, and then it failed between the sleeve and the grips.

Another piece of tubing, also from the same length, having a plain hole drilled through and not reinforced at all, failed across the hole after 3,684 revolutions.

The following is a tabulation of the results just described:

Sleeve pressed on only....	9,320 revs.
Sleeve soldered on........	43,867 "
Without sleeve	3,684 "

These tests point to the fact that sleeve merely pressed into position his little value, but that when fixed to the tube by soldering or similar means it acts as an efficient reinforcement.

A number of tests were carried out at the time on laminated tubes, formed by drawing one light tube over another, to take the place of a tube of the same weight as the two combined. Under the few tests made the laminated tubes withstood vibration and shock much beter than the plain heavy-gauge tube. The only reason we can assign for this is that cold drawing hardens the outside of the walls of the tube more than the center if the tube is a thick one, and by drawing together the two thin tubes to give the same thickness of wall the metal has the benefit of the double drawing operation. Further tests are necessary to prove or disprove this point.

Tube Manipulation

The possibilities of tube manipulation such as butting, tapering, drawing with taper gauge, expanding, flanging, bending, lapping, etc., are becoming better understood. Some designers, however, whilst recognizing the usefulness of these different operations, still ask for what is not commercially possible, because they fail to make allowances for the alteration in the thickness of the tube which will occur as the result of such operations. For instance, if the diameter of a tube is increased the thickness of the wall is reduced, and if decreased in diameter the thickness is increased. Again, if a tube is flanged, the flange will not be of uniform gauge, but will decrease in thickness as it increases in diameter.

A section of a bent tube cut from F2.B undercarriage "V" strut was then shown. The gauge of the tube had by bending been reduced on the outside of the curve from .061 in. to .048 in., and increased on the inside from .061 in. to .072 in. The thinning of the tube would cause it to break if it had not been properly annealed; and, further, if proper mandrels had not been used, or the tubes had not been filled with suitable material, a series of "puckers" or "corrugations" would have ben formed on the inside of the bend. Where proper thickening up of the wall along the inner curve takes place in bending the bent portion of the tube is the strongest, but if "puckering" takes place this point becomes the weakest.

Bending is sometimes carried out on steel tubes whilst in the hot state, but where strength is required this is bad practice, as by heating the tube is rendered much weaker than it would be if bent in the cold state.

Official Specifications for Army Aeroplane Lubricant

(*Concluded from page 723*)

Manufacturers' Approved List

14. The manufacturer shall submit, free of charge, a one-gallon sample of the oil made up in accordance with this specification. Oils which meet the physical and chemical requirements of this specification will be placed on a tentative approved list. The buyer will then order ten barrels of the oil, which will be tested out under actual flying conditions. The oils which successfully pass this service test will be placed on an approved list and may be sold by the manufacturer as his brand of Liberty Aero Oil.

Inspection, Sampling and Shipment

15. The manufacturer shall arrange for the inspection, sampling, testing and shipment of the oil in accordance with detailed instruments to be furnished by the buyer.

Packing and Marking

16. The buyer may require that the oil shall be furnished in wooden barrels or steel drums containing approximately 50 U. S. standard gallons, or in tin containers holding not less than 5 U. S. standard gallons packed two to a case.

17. Tin containers shall be provided with a screw cap not less than 1¼ inches in diameter located in one corner of the top, and with a screw cap vent not less than ¼ inch in diameter located in the opposite corner of the top.

18. Barrels, drums, tin containers and cases shall be plainly marked with the name of the manufacturer, the kind of oil, order number and such other information as the buyer may direct.

Prices

19. Bidders must submit prices on oil in bulk with an additional statement as to the prices of other containers.

The Austrian Berg

(*Concluded from page 720*)

in by a deep engine housing. It is mounted on two spruce bearers, each made up of three laminations, mounted on four transverse partitions. These are made up of a spruce centre with facings of three-ply. The armament appears to have been made up of two machine guns, one on each side of the engine, and fitted with the usual interrupter gear.

The wings, which are both of equal span, present nothing out of the ordinary as regards their construction, except that some of the fittings for the internal wire bracing and compression tubes are exceptionally neat in conception and well carried out. Aerodynamically, however, the wings present an interesting feature. The upper surface of the wing section has a most decided return sweep, beginning behind the rear spar and being of such a magnitude as to present a considerable area of concave surface.

The undercarriage of the Berg is not in place on the machine as exhibited, but from fragments it is judged to have been of the Vee type, and in the accompanying illustration we have endeavored to reconstruct it approximately as various considerations indicate that it must have been.

The tail planes are built of steel tubing throughout, and the fixed tail plane is chiefly remarkable on account of the fact that, although it is built up of single steel tubes, the section is made cambered by bending the single tubes forming the ribs. Both upper and lower surfaces, therefore, have the same camber. The incidence of the tail plane is adjustable, but not during flight.

Later, as opportunity occurs, we hope to be able to publish some illustrations of the more important constructional details of the Austrian Berg fighter.

ACROBATIC FLYING

By LIEUT. CHARLES W. KEENE

THERE is nothing which increases a student's confidence and flying ability like "stunt" or acrobatic flying. It also arouses their enthusiasm and creates rivalry, which is very desirable. There is nothing hard or dangerous about it and any one who has had 20 hours or more solo can master all the stunts I shall describe in one hour with a good instructor, and should then be sent up to do them alone.

In my experience I do not know of a single fatal accident caused from stunting when the pilot had received instruction, but I know of lots of them that could have been avoided had the pilot been at ease when his plane was in awkward positions.

Although I have been flying, off and on, since 1911 I never had full confidence in the air until I learned to do my first tailspin last summer.

Loops

Hold machine down about 20° for a few seconds to get speed.

Pull stick back slowly at first, and faster as plane goes further into loop.

There is less resistence to pull as top of loop is reached, so that a steady pull will bring the stick back at about the right speed.

Stick is all the way back just before top of the loop is reached, No. 2, and is kept in that position until position 3 is reached, when it is pushed slowly forward and reaches neutral, just as the nose of plane comes up to **horizon**, and the machine is then in normal flying position.

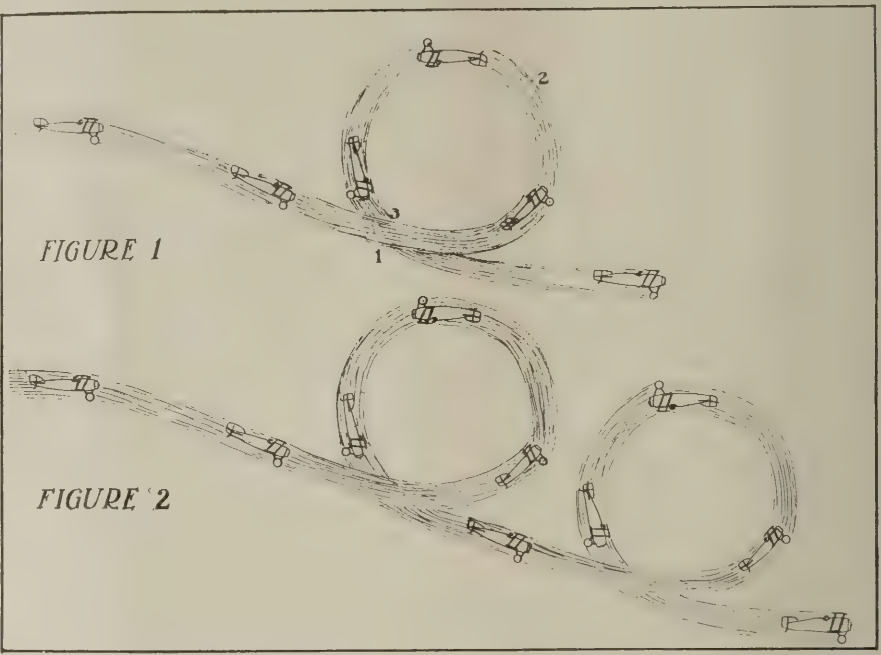


FIGURE 1

FIGURE 2

This method of making a loop prevents coming out with excessive speed.

The pressure on the elevators tend to pull stick forward at about the right time.

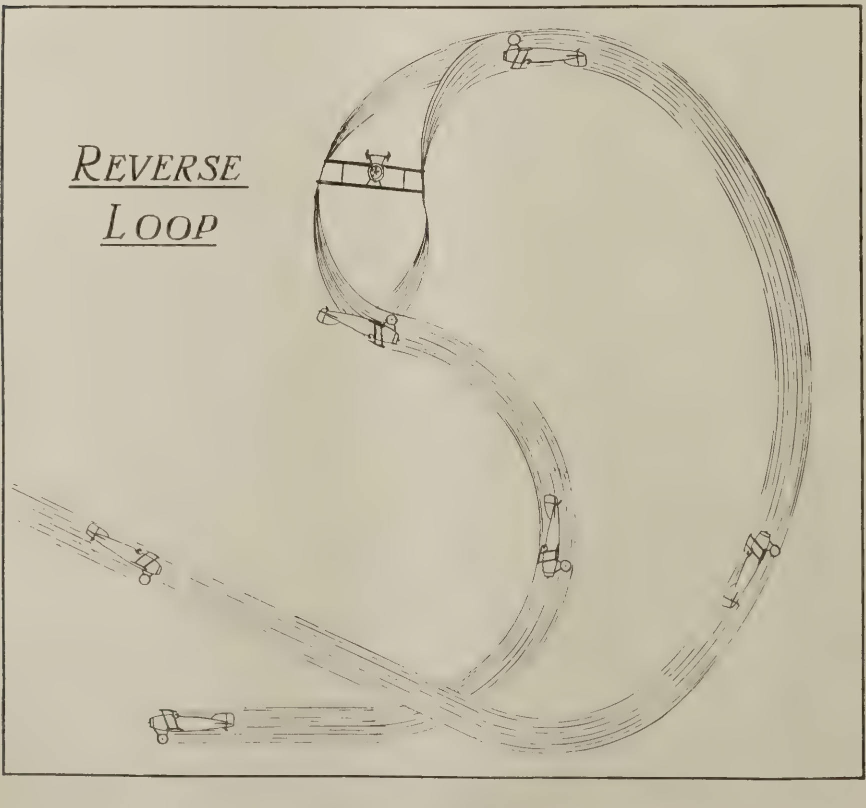
Loops should be fast enough to prevent motor cutting out on top.

There is less strain on plane in fast loop, as the pressure is not reversed on planes as when it stalls on top or falls on over.

When a series of loops are made the stick is pushed forward on coming out of first one in time to stop nose of plane about 20° below horizon, as in Fig. 2, and held in that position until sufficient speed is attained.

It is better to go down at a small angle to get speed, as the motor works better than it does at a steep angle and there is less strain on machine and less distance to go before top of loop is reached.

Loops should always be made when going into the wind.



REVERSE LOOP

Tailspins

There are several different ways of getting into a tailspin, but all of them result from a stall.

The easiest and simplest way is to cut the motor, pull the stick all the way back and push the rudder all the way in the direction desired to spin.

Another way is to climb vertically with motor on until stalled, then give rudder and keep stick back. The plane will fall to side on which rudder is used and go into a flat spin with lots of whip in it. The motor will cut out at the top of the stall, but will start again about the time the spin begins.

Although a spin can be made and taken out with the motor on there is danger of breaking or straining the plane and it is better policy to throttle down.

The way to come out of spin usually taught is to push stick forward to neutral position and give opposite rudder until spins stops. The ship is then in a nose dive and can easily be taken out by pulling back on stick. This method will do the work but one loses a lot of altitude and comes out with excessive speed. A better way is to keep control lever back all the way and give opposite rudder. The machine will stop spinning and level out at the same time and without getting up dangerous speed or losing much altitude. Care should be taken to put stick in neutral as soon as the plane is in a level position or it will go into another spin in the opposite direction.

After the first few turns the speed downward does not increase materially and it is safe to spin any distance.

The pilot in the back seat is seldom killed when a plane falls to the ground in a tailspin.

Immelman Turn

Dive down on a 20° slant to gain speed.

Pull back stick and climb at about 60° angle.

Kick rudder sharply in the direction desired to turn. This will turn plane over on back. Reverse rudder to stop plane in this position, then back to neutral.

Keep stick back until plane comes down and back to level position.

No aileron used.

Start cross wind and turn away from wind to get best results.

Barrel or Roll-over

Start similiar to Immelman Turn but with more speed.

Instead of reversing rudder when upside down, keep a little rudder on and some aileron and stick pushed forward.

Plane will go into side slip and complete turn.

Upside Down Glide

Start same as Immelman Turn when on back cut motor and push stick all the way forward, rudder in neutral.

Machine will glide on back. To come out pull stick back until around in level flying position.

This may also be done from top of loop in same manner.

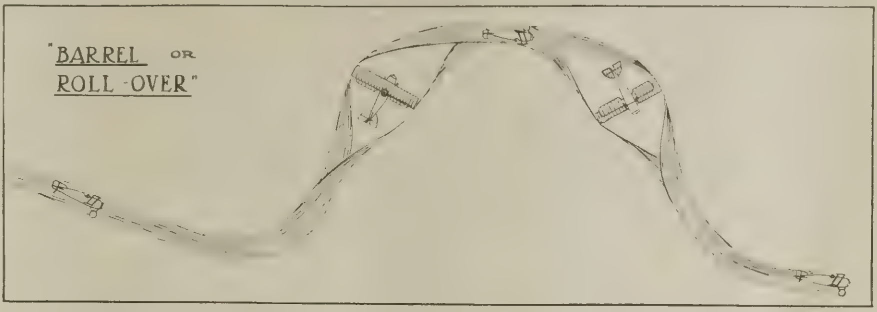
It will be more successful however if loop is made with wind instead of against it so that glide will be against wind.

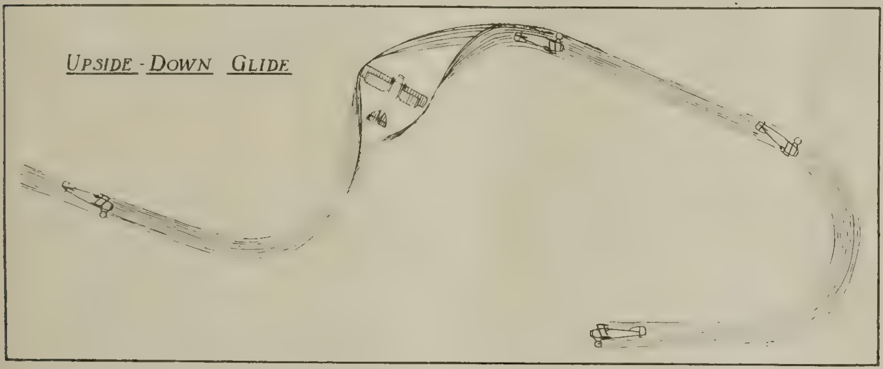
Reverse Loop

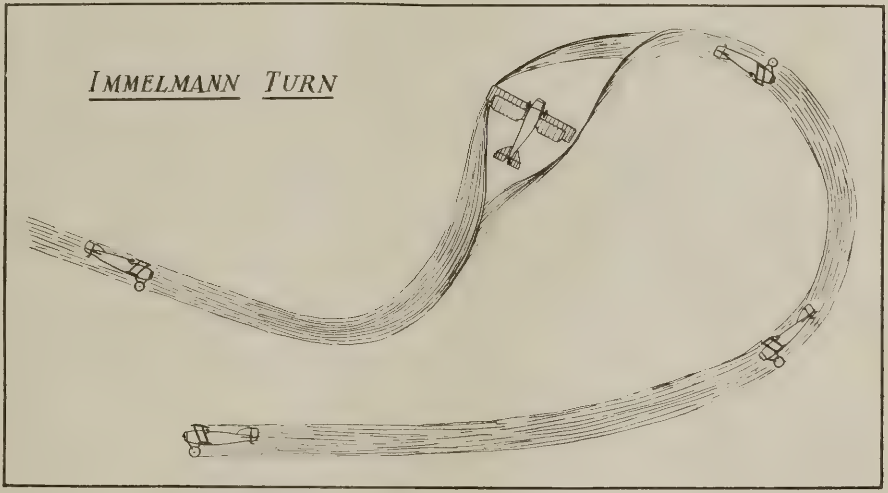
(This is my name for this trick as I learned it myself, however, I think there is another name for it.)

Start same as loop.

When on top, cut motor, push stick forward, and kick rudder sharply. Plane will begin to fall and spin slowly around still on back, when half a turn is made put rudder in neutral and pull back stick coming out in opposite direction.







A Thought for All of Those Flyers of Yesterday

By Capt. Leon Richardson

WRIGHT, Hoxie, Beachy, Johnstone, Badger, Christofferson, Carlstrom, Brindley, and many of our noble, courageous pioneers of the air, both living and dead.

Long live the memory of their achievements, promoting, encouraging, and developing that one great dream of man, materializing that dream into a reality until finally mastering the air by mechanical flight.

The world's greatest enemy across the seas, realizing the great importance aircraft would play in their warring for supremacy on earth, developed this science more so, than perhaps any other nation at the time, and through the tenacles of this German Octupus, caused the various woods and materials required in the building of aeroplanes to be cut, and manufactured and shipped to Germany and in many other manners tied up the various essentials, to that extent, that other nations felt the steps taken by them, when they were caused to build large fleets of aeroplanes for themselves and to question the supremacy of the air with the German.

Thanks to Mother Nature in vesting the territorial bounds of the United States with the vast growths of Pine, Spruce, Ash and Walnut, wood so essential in aeroplanes, and with mineral and brains to supply other allied nations as well as ourselves with these valued treasures, and to have finally wrested from the "Hun" his laurels as Masters of the Air.

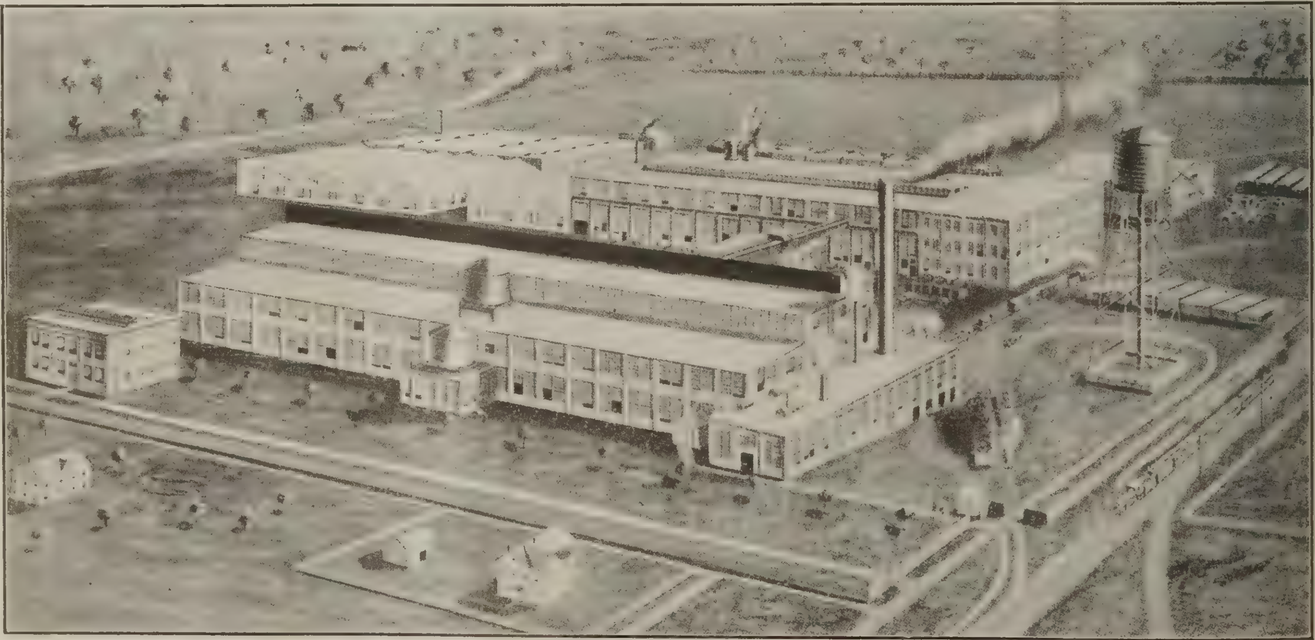
Wood and mineral alone did not solve the problem but only serves as factors. Motors, linen, engineers and skilled workmen all play most important parts, each separate units of themselves—co-operating and co-ordinating until the finished aeroplane product, the performance of the Aeroplane in the air, has been the proof of their efforts.

All these factors which now have produced the War Winning Arm or machine cannot be grouped to then equal the efforts of our now deceased fellow man who gave his all in the advancement of this one science which has and will mean so much more to the world than any other one or individual mehcanical means so far invented and harnessed by the brain and braun of man.

Let us offer silent tribute and prayer to our fallen brethren, let their deeds, memory, and progress, not be forgotten in the humm dumm of battle and advancement of newer designs and achievements, which might cause our pioneer progress, achievements, and advancement and their memory to be forgotten. Therefore a prayer, tribute and thought for our pioneer flyers.

Lawson
AIRCRAFT

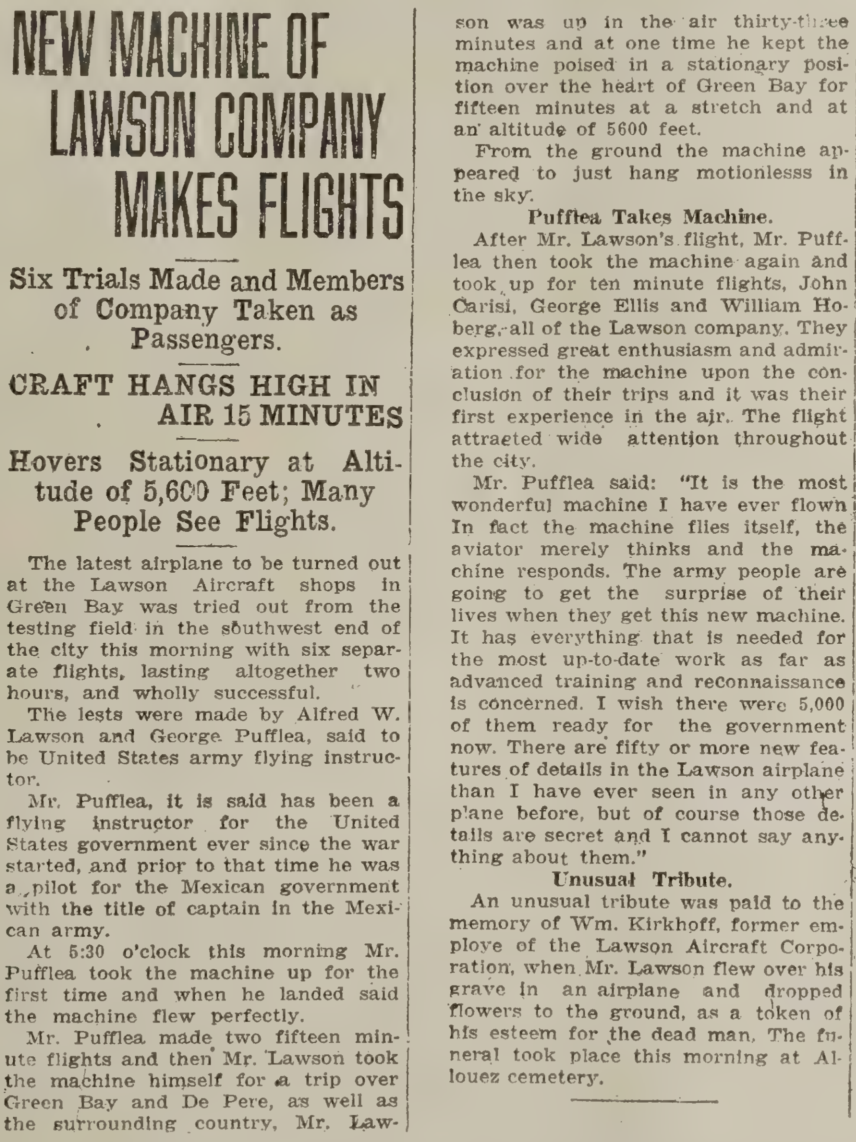
THE PRODUCT



THE PLANT

From Green Bay Press-Gazette

May 2nd, 1918



NEW MACHINE OF LAWSON COMPANY MAKES FLIGHTS

Six Trials Made and Members of Company Taken as Passengers.

CRAFT HANGS HIGH IN AIR 15 MINUTES

Hovers Stationary at Altitude of 5,600 Feet; Many People See Flights.

The latest airplane to be turned out at the Lawson Aircraft shops in Green Bay was tried out from the testing field in the southwest end of the city this morning with six separate flights, lasting altogether two hours, and wholly successful.

The tests were made by Alfred W. Lawson and George Pufflea, said to be United States army flying instructor.

Mr. Pufflea, it is said has been a flying instructor for the United States government ever since the war started, and prior to that time he was a pilot for the Mexican government with the title of captain in the Mexican army.

At 5:30 o'clock this morning Mr. Pufflea took the machine up for the first time and when he landed said the machine flew perfectly.

Mr. Pufflea made two fifteen minute flights and then Mr. Lawson took the machine himself for a trip over Green Bay and De Pere, as well as the surrounding country, Mr. Lawson was up in the air thirty-three minutes and at one time he kept the machine poised in a stationary position over the heart of Green Bay for fifteen minutes at a stretch and at an altitude of 5600 feet.

From the ground the machine appeared to just hang motionlesss in the sky.

Pufflea Takes Machine.

After Mr. Lawson's flight, Mr. Pufflea then took the machine again and took up for ten minute flights, John Carisi, George Ellis and William Hoberg, all of the Lawson company. They expressed great enthusiasm and admiration for the machine upon the conclusion of their trips and it was their first experience in the air. The flight attracted wide attention throughout the city.

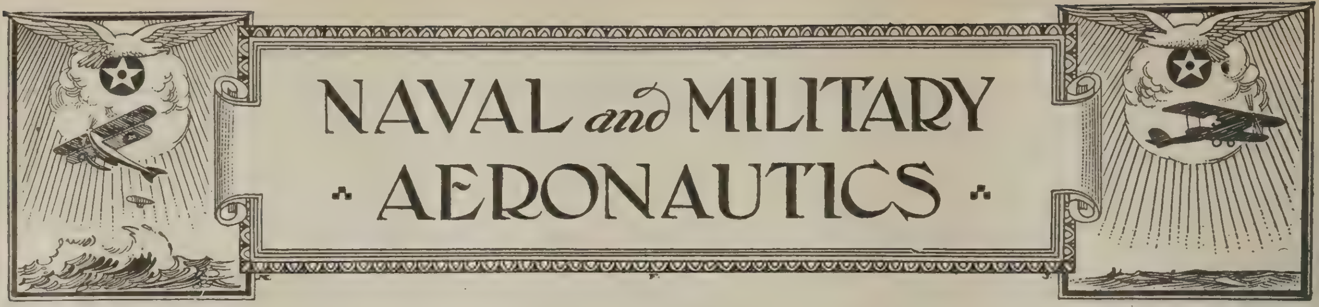
Mr. Pufflea said: "It is the most wonderful machine I have ever flown In fact the machine flies itself, the aviator merely thinks and the machine responds. The army people are going to get the surprise of their lives when they get this new machine. It has everything that is needed for the most up-to-date work as far as advanced training and reconnaissance is concerned. I wish there were 5,000 of them ready for the government now. There are fifty or more new features of details in the Lawson airplane than I have ever seen in any other plane before, but of course those details are secret and I cannot say anything about them."

Unusual Tribute.

An unusual tribute was paid to the memory of Wm. Kirkhoff, former employe of the Lawson Aircraft Corporation, when Mr. Lawson flew over his grave in an airplane and dropped flowers to the ground, as a token of his esteem for the dead man. The funeral took place this morning at Allouez cemetery.

THE PERFORMANCE

LAWSON,
GREEN BAY, WIS.



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 2.—Report to Director of Aircraft Production, Washington, D. C.

Note 3.—Report to the President, Aviation Examining Board.

Note 4.—Report to District Manager of Equipment Signal Corps, Curtiss Aeroplane Corp., North Elmwood Plant, etc., Wire Director of Aircraft Production.

Note 5.—Report to Camp Alfred Vail, Little Silver, N. J.

Note 6.—Report at Madison Barracks, Sacketts Harbor, N. Y.

Note 7.—Assume command at Aviation General supply depot, Chicago, Ill. Wire Director of Aircraft Production.

Note 8.—Report to District Manager of Equipment, 480 Lexington Ave., New York.

Note 9.—Report to 130th Sqdn., Pratt Institute, Brooklyn, N. Y.

Note 10.—Report to Signal General Supply Depot, Fort Wood, New York Harbor.

Note 11.—Report to C. O. Fairfield, Ohio.

Note 12.—Report to Fort Wayne, Mich.

Note 13.—Report to Austin, Texas, School of Radio Operators.

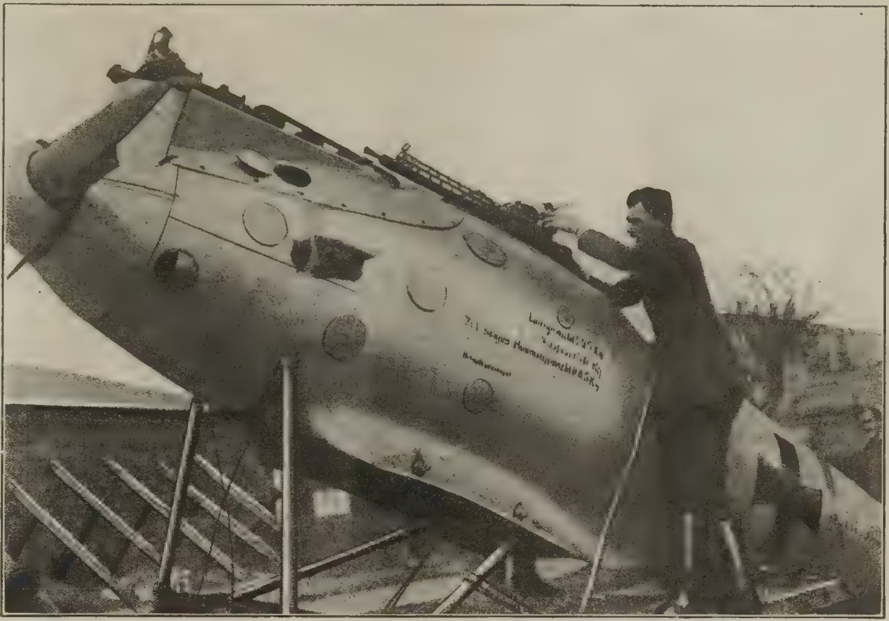
Special Orders Nos. 125-129, inclusive

A

Austin, Calvin E.	DIK
Andrews, William Y.	Note 7
Annan, Duncan	DIK
Atkins, Charles Miner, 3d	SLR; RWT
Azzopardi, Alessio	FLR
Avent, Ira M.	FRF
Ames, Theodore Gordon	SLR
Anderson, Harold	SLR
Archer, Cecil Elmore	SLR
Abbott, Edwin I.	FRF
Ames, Willey M.	FRF
Ames, Shirley L.	FLR; VBW
Anderson, Milton Stanton	SLR
Allard, John, Steton, Jr.	SLR
Anderson, Edwin Ferdinand	SLR; DIK
Adams, James Seybold	SLR; DIK
Aldridge, William Southworth	SLR
Aven, William Ralph, Jr.	SLR
Adams, James D.	TFT
Atkins, Henry C.	TFT
Avera, John W.	CWT
Anderson, Richard M.	EOT
Appelman, Earl	DIK
Ackley, Samuel Fowden	SLR; VBW
Abineau, Marion J.	PFO
Allen, Richard C.	PWM
Allan, Roy F.	LHV
Ammel, Roy William	SLR; LDT
Aubuchon, Joseph M.	LDT
Aleshouckas, Joseph W.	LHV
Arnold, Henry R.	PWM
Allen, Leonard S.	SMM
Allen, Albert A.	FRF
Alvord, Lincoln	FRF
Alexander, Robert Plunkett	SLR; KST
Apple, Addison A.	SLR; KST
Adams, Stanley B.	DIK
Adams, Henry Perry	FLR; Note 11
Allard, John S.	DIK
Aven, William R., Jr.	DIK
Axley, Seth	FRF
Aldridge, William S.	DIK

B

Barksdale, Julian Neal, Jr.	SLR; KST
Brainerd, Madison Edward	SLR; CSO
Butler, Morgan	FLR
Barr, Lester Stewart	SLR; AAD
Behel, Vernon Wilbur, Jr.	SLR; KST
Barnhill, William A.	FRF
Brown, Harrey Leonard	FLR; CSO
Bullard, Edward Lauriston	SLR; CWT
Brokaw, John A.	DIK
Barrett, Vinton E.	DIK
Brant, Gerald C.	REL; KST
Berglund, Eugene Nicholaus	SLR; AAD
Boutwell, Louis E.	FRF
Barnes, Jean Carlisle	FLR
Baker, Robert Horace	SLR; AAD
Beiersdorf, Frederick William	SLR; RWT
Batts, Carl T.	FRF
Barnes, Dwight F.	FRF
Balbach, Nyle J.	FRF
Babcock, Harry Allan	SLR; RWT

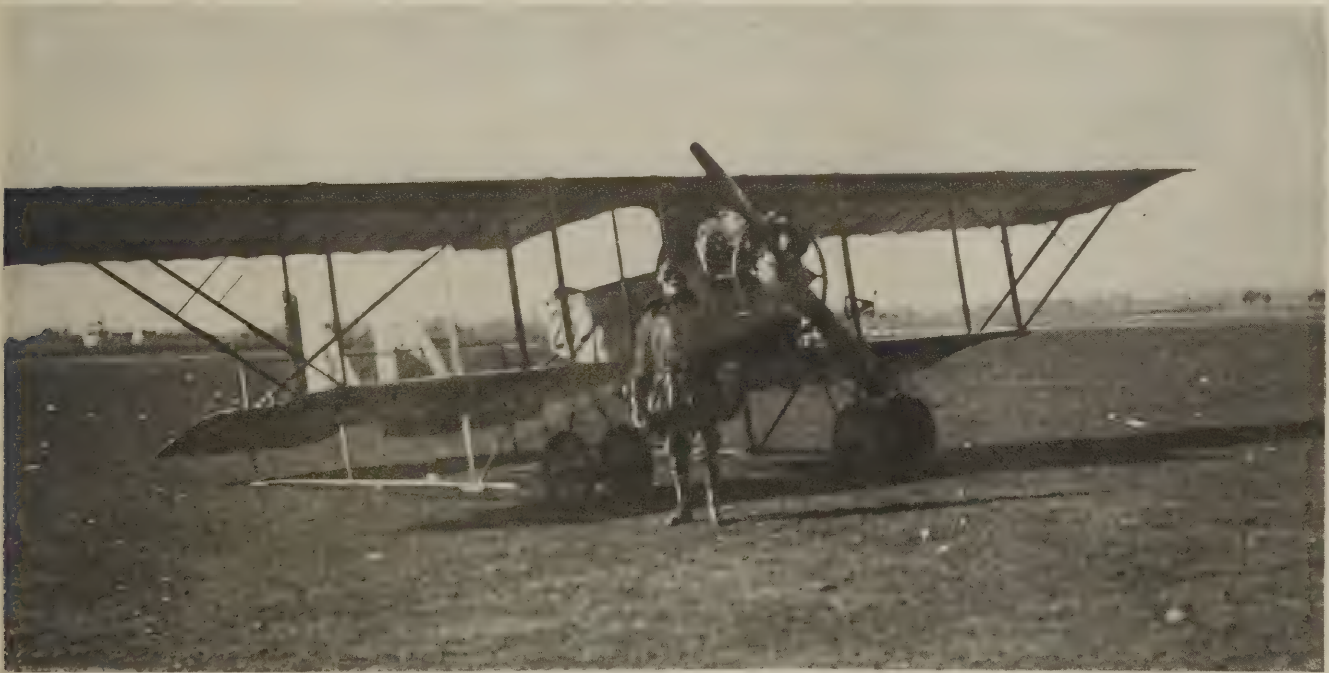


A recent German victim, brought down by one of our Squadrons. The constructional details are of interest

Brewster, Morell K.	FRF
Brandenburger, Walter O.	FRF
Boucher, Clarence K.	FRF
Blackburn, Jack	SLR; GLC
Beaton, Harold W.	FRF
Buchtenkirch, George C.	WAC
Brennan, James T.	FRF
Bonesteel, J. William Kenneth	SLR
Boxell, Earl Francis	SLR
Breckon, Leslie Stewart	SLR
Bruch, Louis Mason	FRF; SLR; DIK
Behr, Kenneth Paul	FRF; SLR; AAD
Bowen, Lewis Love	SLR
Barnes, Robert Henry	SLR
Buser, Albert Ervin	SLR
Bacon, Oliver Greene	SLR; BST
Blain, John Dean	SLR
Baker, Harry Sargent	SLR
Baker, Harold Henry	SLR
Beck, Daniel H.	SLR; DIK
Benton, John William	SLR
Boyd, George Winn	SLR; DIK
Bralley, Ernest Meade	SLR
Brewer, Percy Osborne	SLR
Brown, Harold Leslie	SLR
Brown, Henry James	SLR
Brown, Kenneth Parker	SLR
Brunner, Charles Felician	SLR
Burdick, Lorence Bushnell	SLR; DIK
Burns, George Robert	SLR
Barnard, Albert	SLR
Bartholomae, William August	SLR
Baum, Frank Hutchins	SLR
Bockus, Harry Nelson	SLR; DIK
Boothe, William Henry, Jr.	SLR
Borden, Joseph Louis	SLR
Bisgood, Frederick Whitaker	SLR; DIK
Burroughs, William McCaffrey	SLR; EOT
Bell, Robert Wendell	SLR; RSD
Brown, David K.	SLR; AAD
Burns, LeRoy Wilson	SLR; AAD
Butler, Roy J.	SLR; RSD
Butts, Daniel Edward	SLR; AAD
Barber, Thomas L.	KST
Burgess, George H.	EOT
Begni, Tito	WAC
Blount, Frederick Ripley, Jr.	SLR; RWT
Bader, Eugene Francis	SLR; AAD
Bond, Wilmer Krusen	SLR; CWT
Berger, Earl Osborne	SLR; KST
Bruce, Parker	SLR; LDT
Barrett, William Joseph	SLR; RSD
Baughan, Stephen Decatur Large	SLR; RWT
Baukat, James George	SLR; EOT
Bausher, John G.	TFT
Braun, Bruce E.	TFT
Buck, Edward H.	TFT
Bruch, Russell L.	CWT
Bolz, Adolph Charles	SLR; KST
Bogel, Galitzin Newton	SLR; KST
Belsky, Charles James	SLR; RSD
Barrett, James R.	LDT
Brodrick, William J. H.	LDT
Baker, John F.	Note 3
Bramlette, James Lee	SLR; LDT
Brown, Edward Aprhys	SLR; EOT
Booth, Harold Wilds	SLR; RWT
Blanchard, George K.	PWM
Bender, Ned Joseph	SLR; KST
Burr, Walter Andrew	SLR; KST
Bertaud, Lloyd W.	TMA
Bruner, Donald L.	DIK
Brothers, William F.	TFT
Blandford, James T.	TMA
Burns, Ruel F.	TMA
Bidwell, Robinson E.	LDT
Brants, Harry E.	CWT
Butterfield, Harold H.	EOT
Boulware, George H.	LHV
Bibb, John T., Jr.	PWM
Brewer, Kenneth E.	PWM
Batson, Shelby H.	TFT
Bates, John H.	CWT
Black, Robert O.	EOT
Barrett, William J.	LHV
Bracken, Joseph E.	PWM
Barnes, Kenneth G.	EOT
Bailey, James R.	LDT
Bissel, Paul L., Jr.	PFO
Blackman, Clifford L.	PFO
Burge, Kemp Stucky	SLR; KST
Beresford, Paul C.	FRF
Bagley, James K.	FRF
Baxter, Robert Knighton	SLR; KST
Baird, Chester A.	EOT
Benjamin, Everett F.	EOT
Bracket, Joseph T.	EOT
Bogan, Paul A.	FRF
Bradley, Leslie K.	DIK
Baxley, James H.	EOT
Blook, Harold C.	EOT
Bryant, Marquis V.	Note 13
Bullitt, Joshua Fry	SLR; CWT
Braun, William Parker	SLR; LDT
Blan, Ollie Lionel	SLR; KST
Bowman, Charles E.	DIK
Burns, John L.	FRF

C

Coombs, Cyril Leslie	SLR; RSD
Crawford, Reed Fitzwilliam	SLR; RSD
Creighton, Andrew Donelson	SLR; ELA
Curry, William	SLR; GLC
Cutler, Harvey Donald	SLR
Calkins, Reginald Jackson	SLR
Carpenter, Kenneth	SLR
Caldwell, Frederick Wyllys	SLR
Carroll, Alonzo Marcellus, Jr.	SLR
Codington, Arthur David	SLR
Condron, George Tolman	SLR
Collier, Ralph Phelps	SLR
Creswell, Paul H.	SLR
Croen, Herman F.	SLR; KST
Carter, John Owen	SLR
Crook, Wilson Walter	SLR; DIK
Crawford, Noble Russell	SLR; DIK
Cleveland, Chester Emery, Jr.	SLR; BST
Clark, Dunlap Cameron	SLR
Croom, Marvin Earl	SLR; DIK
Cooper, Edwin Jonas	SLR
Cook, William Lamphere Sturgis	SLR; PMT; FRF
Chaffee, Herbert Norton	SLR; RSD; FRF
Carroll, Alonzo M.	BST
Campbell, Archie H.	FRF



A Caudron training machine. Note the landing gear, which is constructed to withstand the hardest shocks. French Official Photo.

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Some monoplanes at an American Aviation Field in France

Conway, Cornelius M. . . . . FRF
Corkan, Dudley C. . . . . FRF
Clauss, Albert F. . . . . FRF
Carryl, Frank M. . . . . FRF
Curry, John F. . . . . DMA
Cartwright, Paul . . . . . SLR
Caldwell, Edward Fred . . . . . SLR; DIK
Chamberlain, Leo Wesley . . . . . SLR
Clark, Earland Floyd . . . . . SLR
Collier, Trezevant . . . . . SLR
Colliver, Harry Forrest . . . . . SLR
Colton, Earl Glenn . . . . . SLR; DIK
Conlogue, John Augustine . . . . . SLR; DIK
Conrad, Carl Cecil . . . . . SLR
Cook, Ray Charles . . . . . SLR
Corbitt, Marsh Morgan . . . . . SLR
Costar, Lloyd . . . . . SLR
Cotton, John Bowman . . . . . SLR
Croxson, Albert Milne . . . . . SLR; DIK
Cummings, Charles Milton . . . . . SLR; DIK
Cantey, Samuel McGowan . . . . . SLR; DIK
Carroll, Earl . . . . . SLR
Chapman, William Burr . . . . . SLR
Collins, William Frederick . . . . . SLR
Corbet, Clinton Litchfield . . . . . SLR; DIK
Cook, Seth W. . . . . . DMA; EOT; Note 1
Cheney, Moses E. . . . . . Note 8
Chaffee, Raymond O. . . . . . DIK
Corsaut, Jesse Harrison . . . . . SLR; CAF
Coffman, Lionel Alton . . . . . SLR; KST
Campbell, Dudley Rhodes . . . . . SLR; AAD
Cowan, Royal W. B. . . . . . TFT
Crowell, Elmer A. . . . . . TFT
Coward, Raymond S. . . . . . TFT
Conant, Rollis G. . . . . . TFT
Castle, Benjamin F. . . . . . RSD
Carlton, Henry F. . . . . . LHV
Clark, McKinley F. . . . . . LHV
Chadbourne, Reuben J. . . . . . PWM
Christie, Donald Cameron . . . . . SLR; CAF
Cull, Edwin Emory . . . . . SLR; CWT
Campbell, Robert Burns . . . . . SLR; EOT
Colliver, Harold Eugene . . . . . SLR; EOT
Charlton, Donald H. . . . . . FRF
Claude, Laurens . . . . . SLR; KST
Cochran, Thomas B. . . . . . TFT
Caldwell, Jabin B. . . . . . LDT
Cameron, David . . . . . LDT

Crafton, Jesse A. . . . . . SMM
Colvin, Arthur D. . . . . . PFO
Cavagnaro, James F. . . . . . LHV
Crawford, Frank H. . . . . . CWT
Craig, Thomas J. . . . . . SMM
Campbell, Walter M. . . . . . CWT
Curran, Cyril J. . . . . . TFT
Clauss, Albert F., Jr. . . . . . LDT
Cannon, George . . . . . TFT
Cline, Harold V. . . . . . LDT
Cleveland, Lyman W., Jr. . . . . . DIK
Carmine, John W. S. . . . . . LHV
Cox, Arthur S. . . . . . PWM
Carroll, Lee J. . . . . . EOT
Carlson, Carlyle R. . . . . . EOT
Callum, Preston D. . . . . . RTR
Crittenden, William Robert . . . . . SLR; EOT
Carson, Joseph A. . . . . . FRF
Coulter, Isaac H. . . . . . FRF
Cogswell, Harold . . . . . FRF
Cone, Charles Luther . . . . . SLR; KST
Cundiff, William I. . . . . . FRF
Cole, Robert Alfred . . . . . SLR; KST
Conroy, Thomas P. . . . . . FRF
Condron, George T. . . . . . DIK
Carpenter, Kenneth . . . . . FRF
Clark, Arthur T. . . . . . DIK; FRF
Crockett, Eugene W. . . . . . FRF
Chandler, William H., Jr. . . . . . Note 2
Caldwell, Joe H. . . . . . FRF
Carscadin, Henry L. . . . . . FRF
Conway, James V. . . . . . FRF
Crump, Don M. . . . . . FRF
Chase, Paul W. . . . . . FRF
Cauthen, James C. . . . . . FRF
Cotton, John B. . . . . . DIK
Culbertson, Craig . . . . . FRF

D

Doty, David E. . . . . . SLR; FRF; PMT
Davies, Walter Lawrence Jones . . . . FLR; VBW
Dorian, Frank E. . . . . . FRF
Delano, Safford A. . . . . . FRF
DeShazo, Peter H. . . . . . LHV
Doering, Harold . . . . . FRF
Drexel, William R. . . . . . FRF
Dickey, Edward K. . . . . . FRF

American gunners operating an anti-aircraft gun. © Committee on Public Information

Doyle, John C. . . . . . FRF
Doten, Max V. . . . . . FRF
Donovan, John C. . . . . . FRF
Daub, Wade Gordon . . . . . SLR
Dickson, Hunter Adam . . . . . SLR
Daniel, Roy Petery . . . . . SLR
De Lany, Russell Wetzel . . . . . SLR
Despain, Lawrence Newell . . . . . SLR
Dievendorff, Horton Harold . . . . . SLR
Douglas, Bernard Martin, Jr. . . . . . SLR
Dwyer, Martin James . . . . . SLR
Day, Curtis La Q. . . . . . SLR; EOT
Dewey, Robert Adelbert . . . . . SLR; AAD
Drake, Joseph Horace, Jr. . . . . . SLR; KST
Dake, Robert Edward . . . . . SLR; KST
Donovan, John Columbus . . . . . SLR; GLC
Doyle, William J. . . . . . FLR; VBW
Daniels, William Charles . . . . . SLR; EOT
Dalton, Wilfred . . . . . SLR; AAD
Dodds, Hiram E. . . . . . TFT
Draper, Harold Dieckmann . . . . . SLR; KST
Davis, Edwin K. . . . . . LDT
De Hart, James . . . . . DIK
Darlington, Frank . . . . . DIK
De Courcy, William E. . . . . . DIK
Dunn, Walter V. . . . . . DIK
Duane, Richard B. . . . . . WFO
Degener, Paul Arnold . . . . . SLR; DIK
Davies, Stuart J. . . . . . PWM
Dowman, Charles H. . . . . . PWM
De Bettencourt, Manuel A. . . . . . EOT
Davis, Dalphin Alston . . . . . SLR; EOT
Dunn, Thomas F. . . . . . LHV
Doolittle, James H. . . . . . LDT
Dyche, Justin Kimber . . . . . SLR; KST
Dyer, Clarence A. . . . . . LHV
Dana, Dean . . . . . CWT
Donnelley, Clarence E. . . . . . CWT
Duncan, Asa N. . . . . . TFT
Dallas, Burnie R. . . . . . LDT
Dietrich, Richard H. . . . . . LDT
Davenport, William H. . . . . . Note 10
Dodds, Harry . . . . . SLR; KST
Duke, Jack E. . . . . . FRF
Denny, Cary F. . . . . . DIK; FRF
Davis, John Jay . . . . . FLR; Note 2
Dickey, Ralph Cooper . . . . . FLR; Note 8
Doering, Harold . . . . . SLR; CWT
Diggins, Ralph C. . . . . . FRF
Duke, Leslie B. . . . . . FRF
Davis, Earl A. . . . . . FRF
DesChamps, James W. . . . . . FRF

E

Edgerton, James C. . . . . . HHN
Ebright, Carroll Malcolm . . . . . SLR
Ehrlichman, Ben Bernard . . . . . SLR; RSD
Elliot, Arthur Ernest . . . . . SLR; GLC
Ernest, Grant William . . . . . SLR
Ellery, Eugene, Jr. . . . . . SLR
Eustis, Edwin M. . . . . . FRF
Erikson, Erik A. . . . . . FRF; EOT
Eggleston, James D. . . . . . FRF
Elliott, Irl Joseph . . . . . SLR; AAD
Eddy, John Leslie . . . . . SLR
Elhart, Earl Walter . . . . . SLR
Emerson, Sumner Brooks . . . . . SLR
Everett, Aylett Lee . . . . . SLR
Ewing, Henry Gordon . . . . . SLR
Erlendson, Pjetur . . . . . SLR
Elston, Welcome Bridges . . . . . SLR; RSD
Eddy, Arthur Edwin . . . . . SMM
Erhardt, Ursinus Zachery . . . . . SLR; EOT
Ernst, Grant W. . . . . . SLR; AAD
Ellett, Alexander . . . . . SLR; EOT
Easterling, Anthony M. . . . . . DIK
Engh, Harold V. . . . . . PWM
Ebi, Kenneth A. . . . . . EOT
Ellis, Howard J. . . . . . EOT
Emmons, George B., Jr. . . . . . EOT
Elsey, George Wendell . . . . . SLR; KST
Emery, Amos Barton . . . . . SLR; EOT
Erickson, Harry A. . . . . . GLC
Edmund, Harvey W. . . . . . EOT

F

Fields, Frank Eugene . . . . . SLR
Fulwood, Charles Wesley, Jr. . . . . . SLR
Fry, John Oscar . . . . . SLR
Fairfield, Edward Murray . . . . . SLR; EOT
Frederick, Karl Andrew . . . . . SLR; ELA
Fulwiler, Howard D. . . . . . SLR
Falcon, Guilford Ward . . . . . SLR; EOT
Fleming, Hugh Bidlake . . . . . SLR; VBW
Fairbanks, William H. . . . . . MJR
Fieweger, Thomas E. . . . . . LHV
Friday, Ellsworth C. . . . . . FRF
Foster, William C. . . . . . SLR; AAD
Fox, Herbert F. . . . . . SLR; AAD
Ferry, Clinton S. . . . . . FRF
Fowler, Lester Albert . . . . . SLR; RSD
Faust, Thomas Carlyle . . . . . SLR; RSD
Farnum, William Cushman . . . . . SLR
Farthing, Welbourne Owens . . . . . SLR
Faust, Leroy Henry . . . . . SLR
Fitzgerald, Harold Alvin . . . . . SLR
Frankley, Lawrence William . . . . . SLR
Frisbie, Hallet Burtrand . . . . . SLR
Fuller, Robert Nelson . . . . . SLR
French, Samuel Lorenzo . . . . . SLR; RWT
Fitzmaurice, William J. . . . . . REV; DMA
Flynn, Mortimer Gheens . . . . . SLR; LDT
Ferguson, George Francis . . . . . SLR; KST
Fabling, Harry Creed . . . . . SLR
Farris, Homer Virgil . . . . . SLR

Fox, Herbert Franklin	SLR
Frost, John Austin	SLR
Fuller, Edward Reino	SLR
Frank, Norman Daniel	SLR; GLC
Fantham, Murry C	TFT
Fort, Frank B	TFT
Fowler, Louis Foote	SLR· LDT
Fleet, Reuben H	EOT; BST; MAT; Note 1
Fuller, Leonard Beeman	SLR; EOT
Fulton, Richard Wallace	SLR; EOT
Frey, Frederick G	DIS
Freeze, Jackson L	SMM
Fay, Samuel P	TFT
Franklin, William E	TFT
Fields, Curtis P	DIK
Frandsen, Arthur S	DIK
Frankfort, Frederick	SLR; KST
Fuller, Wiley Madison	DIK
Fauvre, Irving M	FRF
Farrar, Delwin Bruce	SLR; EOT
Flachsenhar, Walter R	MAC
Foster, Lee W	DIK
Fulwood, Charles W., Jr	DIK
Frick, Childs	DMA

G

Goree, Jonathan Daniel	SLR
Gheen, Raymond Fearson	SLR
Givens, James Douglas	SLR
Gerrett, John Williamson	SLR
Gay, Ernest Hubbard	SLR
Garrett, Joseph R	FRF
Grieb, William C	SMM
Gleerup, William Weston	SLR; EOT
Guttersen, Granville	SLR; EOT
Guidera, Albert M	LHV
Geisler, Clement G	FRF
Green, Lonsdale, Jr	FRF
Gordon, Harold R	FRF
Goodstein, David M	FRF
Gowans, John	SLR; EOT
Goode, Henry Walton	SLR
Gunn, Roy Eugene	SLR
Gale, James Cloyd, Jr	SLR
Gordon, James Beresford, Jr	SLR
Grady, Harold Henderson	SLR
Giddings, Joseph Attwood	SLR; KST
Gilman, Harold Abrams	SLR; RWT
Goodsell, Ogden Maxwell	SLR
Geiger, William D	FOB
Grant, Sidney B	TFT
Gillett, Mellville	Note 7
Griggs, Milton W	Note 4
Goldsmith, Reginald Max	SLR; KST
Goldthwaite, Joel A	DIK
Glanz, Carl Christian	SLR; PMT
Garrett, Joseph Robert	SLR; PMT
Gormley, Richard Raymond	SLR; RWT
Gandy, Robert Lee	SLR; LDT
Goldie, William Bradshaw	SLR; RWT
Grimm, John Edward, Jr	SLR; RSD
Graham, Arthur Sessums	SLR; KST
Gouverneur, Fairfax Heiskell	SLR; EOT
Gray, Will Klapp	SLR; KST
Glos, Walter Adam	SLR; AAD
Goldsborough, William C	DIK
Gutzler, Raymond William	SLR; EOT
Gay, Ernest H	DIK
Gilligan, Frederick M	EOT

H

Hone, Charles Byron	SLR; EOT
Heffner, Paul	SLR
Henderson, Paul Raymond	SLR
Hooper, James Clinton	SLR
Helgesson, Henry Theodore	SLR
Henry, Percy Clancy, Jr	SLR
Hellman, Richard Hoge	SLR
Hadley, Lawrence Burton	SLR
Hands, Stanley Moore	SLR
Ham, Mark Neely	SLR; EOT
Hitchcock, Francis B	CUI
Hodge, Glenn Boyd	SLR; RSD
Hoggatt, Floyd Lionel	SLR; KST
Helmerich, Walter Hugo	SLR; DIK
Harrington, Herbert G	FRF
Hicks, John	FRF
Heltzen, William Stanley	SLR; PMT
Harpel, Gates	SLR
Hodge, Clarence E	FRF
Hendricks, Walter	SLR; CRI
Heine, Bernhardt Edward	SLR; CWT
Hiscock, Thorp	SLR; EOT
Huffman, Carl Fountain	SLR; EOT
Hill, Edward Hugh	SLR; EOT
Hofstetter, Carl Frederick	SLR; EOT
Hawks, Horace Gilmour	SLR
Hawkins, Ivan	SLR
Hayes, Perry	SLR
Heath, Edward Phillips	SLR;
Hodgkins, Pierce Nelson	SLR
Hoffman, Malvin Gerald	SLR
Hogue, Mark Campbell	SLR; DIK
Hopkins, Edward James	SLR
Hunt, Gilman Charles	SLR
Hunter, Archie Dean	SLR; DIK
Haddock, James Perry	SLR
Harding, Roy Edmond	SLR
Harpham, Edwin Lynn, Jr	SLR
Henderson, Jacob Earl	SLR; DIK
Herrman, Gerald Francis	SLR
Hockett, Roland Redfield	SLR
Hotchkiss, Edward Gillette	SLR
Howard, Harold Harmon	SLR
Hoyt, Warner Fletcher	SLR
Hewitt, Robert Penrose	SLR; CWT
Halpin, John Henry	SLR; EOT
Hanson, Stanwood Lincoln	SLR; EOT
Hirshfield, Ira Wilson	SLR; EOT
Harvey, Harold Mellor	SLR; PMT
Hallem, Harry	SLR; CWT
Hoyt, Fred Day	SLR; RSD
Hollingsworth, Frank E	TFT
Hamilton, Pierpont Morgan	SLR; AAD
Harper, Oliver Clifton	SLR; KST
Hogan, William A	TFT
Hill, Armstead B., Jr	TFT
Husted, Merle R	TFT
Hyde, Gordon Eugene	SLR; PMT
Hamann, William Paul	SLR; HHN
Hawley, Herbert	SLR; EOT
Houston, Horace K	DIK
Hoyt, Howard C	DIK
Hillix, Albert Ficklin	SLR; RWT
Hardie, John Ford	SLR; LDT
Hand, Julius Mills	SLR; EOT
Hansen, James Henry	SLR; CRI
Heywood, Oliver Charles	SLR; KST
Howe, Lawrence L	FRF
Hackedorn, Hillis Fee, Jr	SLR; EOT
Hammond, Fred R	DIK
Hardy, Richard L	DIK
Harriman, Walter F	DIK
Harris, Allan B	DIK
Hendricks, George F	DIK
Hostetler, Wilbur D	DIK
Hyland, George N	DIK
Houser, Percy Thomas	SLR; EOT
Hirshfield, Ira W	CWT
Hooper, Arthur U	PFO
Hill, Richard Junius	RTR
Hopkins, Ward Dean	SLR; LDT
Hangan, Alfred J	DIK
Halsted, Harold C	EOT
Hoffman, Jay F	DIK
Healey, William R	FRF
Hillman, Alfred D	FRF
Hightower, G. B	MAC
Harris, Carl A	FRF
Hoadley, George, Jr	SLR; FRF; PMT

I

Inlow, Walter Thomas	SLR
Isbill, Paul M	LDT
Illett, Edward Wilson	SLR; EOT

J

Johnson, Everett Bailey	SLR
Jones, Clifford Earl	SLR; RSD
Jones, James D	LHV
Jurdeh, Leonard Wells	SLR
Jaynes, John Belmont	SLR
James, Roy P	FRF
Jacomini, Clement, Jr	SLR; FRF
Jaggard, Robert Kenneth	SLR
Jaccard, William Nile	SLR
Jacquemart, Eugene Arthur	SLR; DIK
Jenkins, Nelson Durfee	SLR; GLC
Jones, Elmer Hugh	SLR; CAF
Johnson, Alfred Ridgely	SLR; Note 2
James, John R	SLR; RSD
Jackson, Clyde H	TFT
Jefferson, Theodore	TFT
Jannus, Roger W	REV; DMA
Jackson, Paul C	DIK
Jenks, Henry Irving	SLR; EOT
Johnson, Clare Thomas	SLR; EOT
Jack, Butler, Jr	DIK
Jaenkle, William D	DIK
Jordon, James J	LDT

K

Knox, John Walter	SLR; AAD
Knox, Merton Hugh	SLR
Knight, Rixford	SLR; GLC
Kirby, Samuel Bonner, Jr	SLR; DIK
Kuhn, Leo Warren	SLR; EOT
Kelly, Ralph Morse	SLR
Kramer, George E	SLR
King, Harry C	FRF
Keeler, John Fitzallan	SLR
Kennedy, Robert Emmett	SLR
Kievlan, Charles Edgar	SLR
Kinder, Roland Hugh	SLR
King, Alexander Mann	SLR
Knupp, Glenn Harold	SLR
Kohler, Carlos Chester	SLR
Kyle, William Forrest	SLR
Kier, Samuel Max	SLR
Kennedy, William Edward	SLR; DIK
Kratzer, Henry W	DIK
Keeling, Walter Sherman	SLR; PMT
Kinney, Judson Stevens	SLR; RWT
Kelly, Oakley George	SLR; RSD
King, Alfred F	DIK
Kiefner, Charles Edward	SLR; RWT
Kauffman, Carl Ruby	SLR; RWT
Kelly, Bernard Edmund	SLR; KST
Kolb, William M	DIK
Kuntz, Frank E	TFT
Kennedy, David S	TFT
Kesl, Roy William	SLR; VBW
Kanitz, Edwin C	DIK
Keil, Emil C	DIK
Keyes, Nelson B., Jr	DIK
Kingsley, Charles	DIK
Kilbane, James Anthony	SLR; KST
Kornrumpf, William L	DIS
Keller, Frederick W	DIK
Kirkendall, Freeman B	DIK
Kinnear, Thoburn W	SMM
Kennedy, Carl Francis	SLR; CRI; FRF
Kent, Thomas Thatcher	SLR; KST
Kirk, John B	FRF

L

Littlefield, Robert Clement	SLR
La Fon, Alphonse	LHV
Lundgren, Theodore Sophus	SLR; RWT
Lile, Richard Leon	SLR; DIK
Loder, James Augustus	SLR
Lowell, George Clough	SLR
Lynch, Frederick Dan	SLR
Larson, Westside T	SLR; FRF; PMT
Laing, Joseph A	LHV
Leferink, Richard	DIK
Lang, William J	WAC
Lienhard, John H	FRF
Laubenfels, Clarence Rudolph	SLR
Lawson, William Eric	SLR
Leonard, Cecil Ebenezer	SLR
Lindsley, Dan Leslie	SLR; DIK
Lowenstein, Milton Dewey	SLR
Lansing, Jack Courtney	SLR
Leonard, John Lawson	SLR; DIK
Levitt, Morse David	SLR
Lewis, Harold McQuade	SLR; DIK
Lockwood, Albert Curtis	SLR; Note 5
Lee, George F	Note 6
Lewis, David Everett	SLR; EOT
Lawrence, Dudley B	WDM
Lawrence, Almon Rowell	SLR; EOT
Logan, John A	SMM
Lyle, Samuel P	LDT
Logan, Leland	SMM
Lindsay, Oliver C	PFO
Laezar, Augustus	DIK
Leek, John B	DIK
Linder, John	DIK
Logel, Joseph F	DIK
Lachmund, Harry G	LHV
Lyons, Philip T., Jr	DIK

(*Continued on page 738*)

One of the American aviation fields in France

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FOREIGN NEWS

FRANCE

The official report of the War Office June 10 says of aerial operations:

"On June 9 our pursuit escadrilles destroyed or put out of commission eleven enemy aeroplanes. Our bombing aeroplanes attacked without respite enemy troops massed behind the front of the attack.

"In the day of June 9 and the following night, despite the bad weather, eighteen tons of projectiles were dropped on concentration points, convoys, and railway stations, particularly the station at Roye, where a great fire, followed by explosions broke out.

"During the month of May, 28 German aeroplanes were brought down by means of our anti-aircraft guns, three of them at night. Twenty other machines, damaged by our fire, were obliged to abandon their mission."

The French official report of June 11th says:

"Our day bombing machines continued their operations on June 10, despite the bad weather, against points of a more exposed nature on the battlefield. Aeroplane groups, flying low, dropped projectiles on enemy concentrations, dispersing reinforcing troops and causing considerable losses.

"Certain squadrons made sorties, and during the day eight tons of explosives were employed in this manner, giving the best results.

"On the night of June 10-11, the bombing of the enemy's rear areas was continued actively. Our escadrilles dropped twenty tons of projectiles on convoys, cantonments and railway stations, as well as on two munition depots

"An explosion occurred in the region of Chaulnes, another in the neighborhood of Soissons. A fire is reported to have broken out in the station at Fismes.

"On June 10 four German planes and one captive balloon were brought down by our pursuit machines."

The night report of June 12 from the French War Office thus summarizes aerial operations on the front of the German drive:

"Our day bombing machines continued their operations yesterday, participating with their usual audacity in a counterattack launched by us on the Montdidier-St. Maur front. They attacked with bombs enemy divisions who had come up to sustain the shock of our troops against the right wing.

"Before this attack the enemy units were obliged to disperse, leaving dead on the ground, convoys were bottled up, and heavy artillery batteries, under heavy punishment, were abandoned by the gunners, who ceased to fire. A convoy took fire, and a great fire broke out in Ressons-sur-Matz, where there was a large concentration of enemy troops. A total of twenty-six tons of projectiles were dropped with excellent results.

"During the night our bombing squadrons dropped thirteen tons of explosives on railway stations in the enemy zone, notably in the region of Nesle, Roye, and Ressons- sur-Matz. Additional fires were started by these bombardments.

"On June 11 our pursuit machines brought down or put out of commission thirteen enemy planes."

The War Office on June 13 issued the following:

"On June 12 our bombing planes dropped in the battle zone sixteen tons of projectiles, and twenty-five tons last night on cantonments, convoys and marching troops behind the enemy front, and bombarded, as well, the villages of Ressons-sur-Matz, Richquebourg and the regions of Roye and Guignicourt. Several fires were observed. The same day seven enemy aeroplanes were brought down and nine were put out of action.

"In the first week of June thirteen enemy planes were brought down by anti-aircraft guns. One hundred and ten aeroplanes, carrying 32 bombs each, charged at the height of 1,000 yards and broke up an enemy concentration.

GERMANY

The official statement regarding aviation, issued on June 10, says:

"Thirty-seven aeroplanes and six captive balloons were shot down yesterday."

The evening official statement of June 13 from General Headquarters says:

"In the last two days thirty-five enemy machines have been shot down. Captain Berthold and Lieutenant Menkhoff obtained their thirty-third aerial victory; First Lieutenant Schleich, his twenty-ninth and thirtieth; Lieutenant Veltjens, his twentieth and twenty-first, and Captain Reinhardt, his twentieth."

GREAT BRITAIN

The Germans bombed British hospitals in France seven times between May 15 and June 1, according to a statement made in the House of Commons by J. I. Macpherson, Under Secretary of the War Office. The casualties numbered 991. These were as follows:

Killed—Officers, 11; other ranks, 318; nursing sisters, 5; Women's Auxiliary Corps, 8; civilians, 6.

Wounded—Officers, 18; other ranks, 534; nursing sisters, 11; Women's Auxiliary Corps, 7; civilians, 73.

The official statement on aerial operations June 10 says:

"On Sunday our flying squadrons, co-operating with the French on the Noyon-Montdidier battlefront, worked continually from dawn till dark. Our bombing aeroplanes impeded the enemy's advance and harassed his troops and transport with constant machine gun fire.

"Strong patrols of scout machines swept the battle area throughout the day, while high flying aeroplanes protected those below from air attack.

"Among the targets hit were an aerodrome near Roye, where hostile machines on the ground were set afire, an ammunition dump at Montdidier, which went up in a sheet of flame, canteens and wagons at Couchy, lorries at Laguy and Hainvillers, and infantry in trenches and on the roads along and behind the whole fighting line.

"On the British front there was little enemy activity in the air, but our machines carried out a good deal of artillery observation work until stopped by rain. One of our artillery machines forced a two-seater German machine to land and surrender at the aerodrome to which our machine belonged.

"Fourteen other German planes were downed and four disabled. A hostile balloon was shot down in flames. Four of our machines are missing."

The official statement on aerial operations for June 11 says:

"In spite of the cloudy weather yesterday our airmen on the French battle front worked early and late, dropping eight tons of bombs on enemy troops, transport and ammunition dumps, guns and trenches. Direct hits were obtained on the railway at Roye-sur-Matz and concentrations of infantry in the triangle comprising Montdidier, Richquebourg and Roye.

"Flying low, our machines attacked with machine gun fire every target that offered itself along the roads behind the fighting line, and an immense number of rounds were fired from the air with good effect.

"In this area we shot down six enemy aeroplanes and drove seven down out of control, we ourselves losing five machines.

"On the British front there was little aerial activity. One German aeroplane was destroyed and one was driven down out of control. We lost two machines.

"During Monday night we dropped seven tons of bombs on Cambrai and Bapaume. All our night bombers returned."

Field Marshal Haig's report from British headquarters in France June 12 says:

"Twenty-one enemy aeroplanes have been destroyed on the Italian front by the British air forces operating there.

"Yesterday British aeroplanes assisted French aviators in a counterattack on the western portion of the Noyon battle front by special patrols sent out to deal with German machines, as well as by vigorous and constant bombing of enemy trenches, gun positions, and communications.

"A heavy machine gun fire was directed from a low altitude upon hostile troops and transports throughout the same area.

"Ten German aeroplanes were destroyed during these operations and four were driven down out of control. We lost three machines.

"Two of our machines reported yesterday as missing have returned.

"Since the German attack began on the Noyon sector on June 9, our squadrons, co-operating with the French, dropped twenty-one tons of bombs and accounted for twenty-nine enemy machines.

"The total weight of bombs dropped by us yesterday, including those dropped beyond the French battle lines, amounted to fourteen tons. On Tuesday night our night-bombing machines heavily attacked the railway at Cambrai and billets at Frémincourt, dropping four tons of bombs without loss.

"On the British front two hostile machines were shot down and two others were driven down out of control. One of our machines is missing."

The official statement on aerial operations issued June 13 says:

"During yesterday's operations light bombardment squadrons performed the unprecedented feat of attacking German heavy gun batteries in action and silencing them by killing or scattering the gunners.

"Our flying squadrons on the French battle front were chiefly engaged in offensive patrol work, seeking German machines and fighting them wherever found. They destroyed fifteen enemy aeroplanes, some of which went down in flames, others broke in the air. One of our machines in this sector is missing.

"On the British front a good deal of aerial reconnaissance, photography and artillery observation was carried out. We lost two machines and destroyed five German machines. Two other hostile machines were driven down out of control, while a German observation balloon was brought down in flames.

"Twenty-two tons of bombs were dropped by us during the day, the principal targets attacked being the Don junction, railways at Courtrai, Armentieres and Chaulnes, a dump at Bapaume and the Bruges docks. The weather at night was unsuitable for flying. Two successful raids were carried out by our squadrons against the Metz Sablons railway station and sidings. Many heavy bombs were dropped. On Thursday one squadron of our aeroplanes attacked the station of Treves, another dropped a ton of bombs on factories and the station at Dillingen. At the same time factories and the station at Hagendangen were subjected to an attack. At Dillingen direct hits were observed on two furnaces. Successful long distance photographic reconnaissances were carried out by other machines.

"In the course of attacks made by the enemy on our bombing machines, one hostile aeroplane was destroyed and two others were driven down. One of our machines is missing."

The British statement for June 16th says, "Twelve German machines and one balloon were brought down by our airmen yesterday. Nine tons of bombs were dropped on Zeebrugge Mole and on other targets in France. Flyers of the Aegean Squadrons bombed enemy works and aerodromes on the Turkish and Bulgarian coasts and shot down two fighting scouts. Five of our machines are missing.

During the period between June 6 and 9, inclusive, ten bombing raids were carried out, according to an Admiralty statement. The objectives were Thourout, Zeebrugge lock gates, the Brugeoise works, Bruges docks, Bruges Canal, Chistelles aerodrome, Marialter aerodrome, St. Denis-Western aerodrome and the Mostacker aerodrome.

"In all," says the statement, "fourteen tons of bombs were dropped. Fires were started in the Bruges docks, the Marialter aerodrome and and the St. Denis-Western aerodrome. Four fires and two explosions were caused in the eastern basin at the Bruges docks. Two direct hits were observed on the Mole at Zeebrugge. Heavy anti-aircraft fire was experienced and attacks by enemy aircraft were driven off.

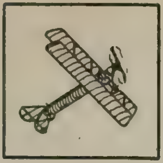
"In home waters during the same period numerous anti-submarine and hostile aircraft escort patrols were carried out by seaplanes, airships and aeroplanes. Submarines were sighted and bombed, enemy lines were located and floating mines sunk.

"On occasions while on patrol single British machines have been attacked by enemy formations. In one case a stray bullet shot away the control and a British machine was forced to alight. The crew subsequently was rescued by another British seaplane which had been sent in search for them. In another instance our machine, after being disabled, was sunk by hostile machine gun fire, the crew being rescued."

ITALY

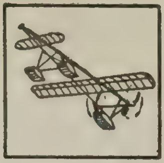
Five hostile aeroplanes were brought down and four tons of bombs were dropped on the enemy's depots and communication junctions, according to the official statement issued by the War Office on June 10.

The official report from Headquarters at Rome issued on the 11th of June says that during the day five Austrian aeroplanes were brought down by the Italians.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aero Engineering

PUSHER type models, that is the twin propeller racing kind, are easier to balance than the tractor single propeller type, this is why 90 per cent of the model flyers today prefer the former.

Much difficulty was at first experienced with tractors, especially in the way of longitudinal stability, and for this reason model flyers in the early days of 1910 and 1911 abandoned them entirely.

In the last few years tractors have taken their place in the model records only because model flyers of today do not try to copy the big machines as the older flyers did.

The trouble was the older flyers, in attempting to copy Bleriot, Antoinettes, Moranes, etc., succeeded in only partially doing so, for, while the shape of wings and fuselage, etc., was tolerably similar to the full size prototypes, in the most important part of all, namely, the distribution of weights, they failed utterly. Generally the center of pressure of the main plane of the full size machines varies but little from the center of gravity. In models of the early days the center of gravity came about the mid-section of the fuselage, and of course the model was entirely out of balance, and when attempting to fly it would slide back on its tail.

Model flyers became so disgusted with troubles encountered by flying tractors that they turned to the copies of the Voison Canard, Valkyrie, and others. These types had the main planes at the rear, traveling sort of tail first; at the front of the machine a small elevator was placed at a greater angle of incidence than the main plane and this succeeded in stabilizing the machine longitudinally while in flight.

In 1913 records with tractors began to climb and only because model flyers began to construct models after their own ideas. The most successful was a little machine constructed by Chas. V. Obst traveling on an average of 800 feet distance and as much as 40 seconds duration. In order to overcome the old difficulty he moved his main plane back to one-third the distance from the nose of the machine as shown in the figure at the top of the accompanying drawing.

The trouble with rubber driven tractors is on account of the motor running all the way to the rear; naturally the center of gravity then lies about the center of the frame. The only thing that can be done to correct a condition of this kind is to make the propeller heavier, thereby adding a lot of unnecessary weight, or by shortening the motor to about two-thirds of the distance from the nose of the machine, which would of course shorten the flight of the model.

I have seen a tractor model four feet long, having the main plane about 24 inches from the nose of the machine, fly long distances and keep absolutely stable, so from this model flyers will see that in order to make a successful tractor the whole secret is to balance the model properly without trying to copy the large machines too closely.

The accompanying drawings clearly show how the balance of a model varies from the big machine.

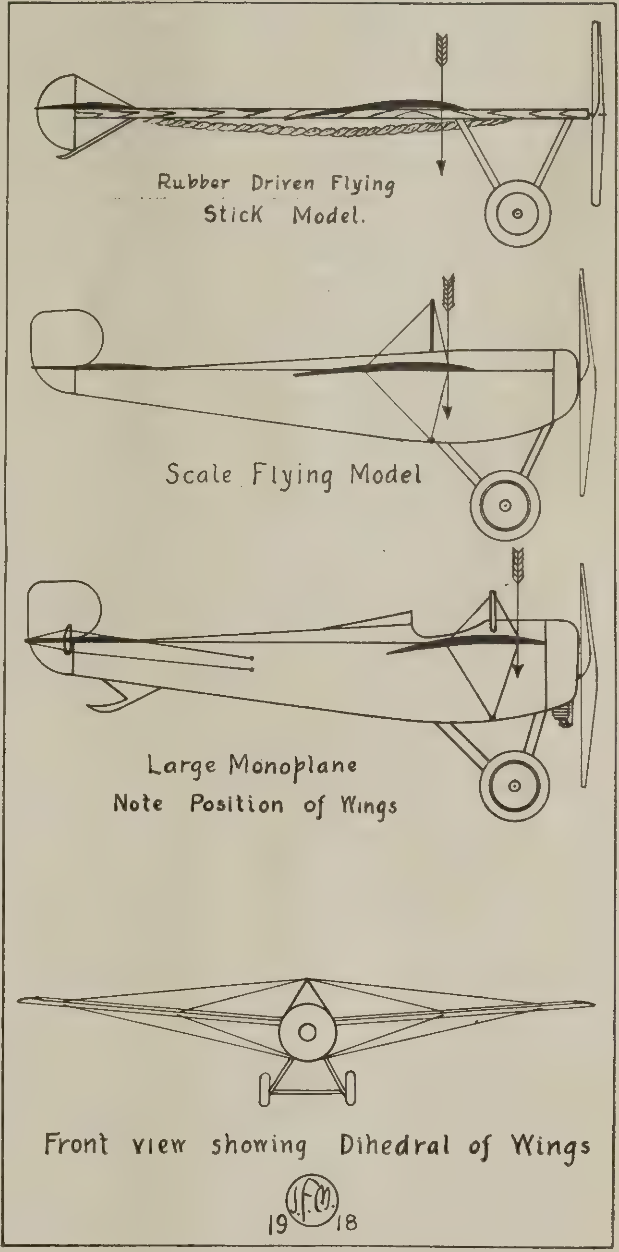
At the top of the drawing is a rubber driven flying stick model of the racing type. The rubber motor runs to the rear of the frame, and of course the center of gravity lies at the point indicated by the arrow. It is only necessary to place the wing over this point, giving the plane a slight angle of incidence, to make the model balance perfectly.

The next figure shows a scale model of a monoplane driven by rubber bands. The model resembles the large machine in every way, only that the wing must be moved back considerably to a point over the center of gravity, which will not affect its flying qualities any.

The 3rd figure shows a large size machine. The readers can clearly see why it is possible to get the main plane so near to the nose of the machine. The weight of the motor in the nose of the machine brings the center of gravity well up to the front of the machine. Also the weight of the pilot and fuel help to accomplish the same thing. This allows for a close coupling of the motor and the pilot's seat, making the machine easy to control.

At the bottom the figure shown is to show the reader how, by giving the wings what is known as a dihedral angle, to help the machine to become almost inherently stable. Inherent stability is quite a study and we will treat it in another article.

(To be continued)


Rubber Driven Flying Stick Model.
Scale Flying Model
Large Monoplane Note Position of Wings
Front view showing Dihedral of Wings
JFM
19 18

The "Junior Aeronautical Reserve"

The Aero Club of the Lane Technical High School of Chicago, Ill., have become a unit of the "Junior Aeronautical Reserve." Secretary of the Club Mr. Geo. G. Neuman says the Club realizes the benefits to be gained in co-operating with a movement of this kind, especially when you consider the help model flyers can give their country later.

The "Junior Aeronautical Reserve" now has two prominent Clubs as members of this organization, the one mentioned above and the Correspondence Model Aero Club of Babylon, L. I., and also scores of individuals from all over the United States who would like to become affiliated with Model Clubs to take up this work.

A list of Model Clubs appears from time to time at the top of Model News, and it would be well for Model flyers who wish to take up the study of Aeroplane flight and Construction, to get in touch with secretaries of the Clubs nearest them, and tell them they wish to take up Model Aeroplane Building to help them to better their aeronautical knowledge.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

'Plane o' Mine

(*With apologies*)

When you are happy, 'plane o' mine,
And all your parts are true,
Show me your worth, your speed divine,
And let me soar with you.
Show me the prop that spurs you on,
The stunts you mean to do,
The twists and turns that foil the Hun,
And let me joy with you!

When you are mad and hard to hold,
And all the skies are dark;
When you plunge through the beastly cold
And leave me stiff and stark;
When you are wobbling to and fro,
As only B.E.'s do,
Tell me what breaks and brings you low,
And let me stand with you!

So, when the sight falls tremulous,
When the last strut droops low,
And one of us, or both of us,
The long, long drop must go;
When the old petrol-tank's aflame,
And everything's askew,
Whatever fate our souls await,
Still will I "swear by" you!

"Say, Mister, will ye please take Robert fer jest a short ride? He's got th' airy-plane bug bad."

Heard on the Street

Have you noticed how many girls are wearing Liberty buttons now?

Yes, they are all the style and reasonable, too.

More Truth Than Poetry

Speed the lathe!
Our men to save!

To give the Kaiser pains
We'll make enough of those scout planes,
Until they become *rout planes.*

C. W. T., Roselle Park, N. J.

An Alphabet

A is for the air that supports us on high,
B for the blue of the smiling sky.
C stands for currents that speed us along,
D for the death when something goes wrong.
E is the elevator that guides our flight,
F the fuselage where we sit snug and tight.
G stands for gas that makes engines go,
H is the Hun we all despise so.
I for injustice of reducing our pay,
J stands for Jehovah—guide us we pray.
K for Kilometers we travel each hour,
L is the light that gleams from the tower.
M the metres square in our plane,
N stands for nerves that endure every strain.
O is the oil for engine, joint and wire,
P means the pusher of which we soon tire.
Q is the quiz that makes cadets hump,
R is for rubber, it eases each bump.
S is the surface kept shining and bright,
T stands for training that makes us fly right.
U for the use we will be in this war,
V for the victory we expect more and more.
W is for good weather on which we depend,
X the ex-perience of value without end.
Y stands for yellow that none of us show,
Z for the Zip that makes it all go.

H. F. Greaves.
1st Lt. A.S.S.C., A.E.F., France, American Air Service.

My Flying Boy

(*The Mother's Point of View.*)

My daring, wonderful, flying boy
With his movements quick, his eagle eye,
He finds his way in the pathless sky,
And skims the clouds with a reckless joy.

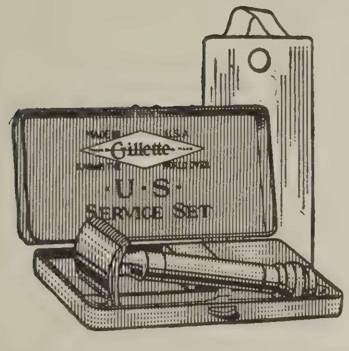
With dauntless courage and iron nerve
He mounts, and he floats, and dips, and turns,
And feels the kiss of the sun that burns
And the rushing wind in every curve

I see him afar, a speck above,
In the rosy clouds, a shining beam,
And wonder if it is all a dream,
And I only see a dear white dove.

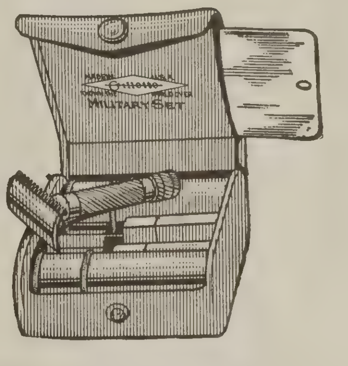
I am waiting here with speechless joy.
I pray for his safe return to me.
I hear him approach, my humming Bee,
My daring, wonderful, flying boy.

Lily Gordon-Ascher.

Gillette SAFETY RAZOR



The New U. S. Service Set.—A solid metal case, heavy nickel-plated and embossed with the insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box, indestructible Trench Mirror inside the lid . . . $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

It's no trick at all to get a clean, comfortable shave in "once over" time with a Gillette

Thousands of men, in every Army and Navy of the civilized world, have "proved up" the Gillette under the most difficult shaving conditions that any razor was ever asked to meet. Here is the real *service razor*—and it brings home-comfort into ship and camp.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

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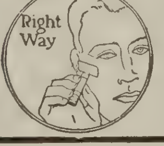
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave. Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn.*



Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard. Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

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A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
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Gillette Safety Razor Company
Boston Mass·U·S·A·

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Toothing Machine

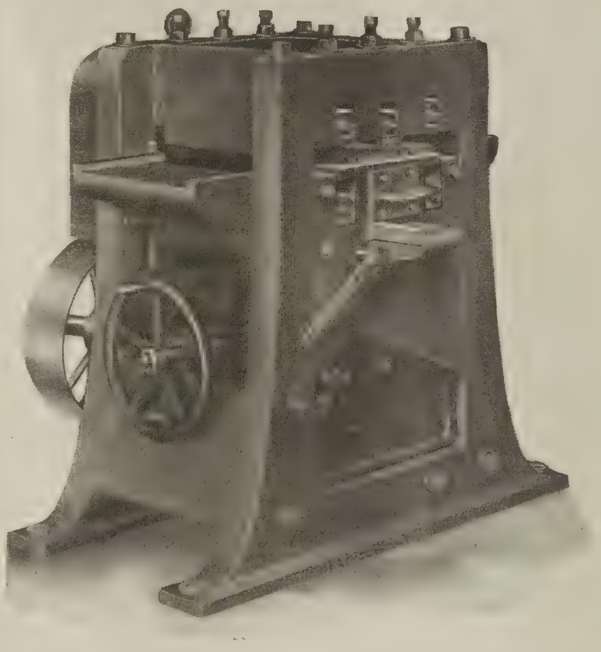
If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog
and samples of toothing

Baxter D. Whitney & Son
WINCHENDON MASSACHUSETTS



Whitney Scraping and Toothing Machine

(*Continued from page 733*)

Liggett, Arthur George	SLR; KST
Lockhart, Frank	FRF
Loder, James A.	DIK
Low, Raymond P.	FRF

M

Marion, Ralph	SLR; VBW
Miller, Lester J.	FRF
Marshall, Howard Parsons	SLR
Mihleder, Philip George	SLR
Miller, John H.	SLR; Note 5
Midkiff, Robert Forrest	SLR
Marsh, Ralph Arnold	SLR; KST
Martin, Charles J.	FRF
Moore, John S.	PWM
Mitchell, Donald Harlow	SLR; PMT
Midyette, Dayton Ralph, Jr.	SLR
Moon, Odas	SLR; EOT
Murphy, Ralph Joseph	SLR
Morris, Harley	SLR
Morris, David Benjamin	SLR
Marshall, Charles Clark	SLR
Maitland, Lester James	SLR
Mahoney, Frank Herbert	SLR
Morrow, George Dwight	SLR; EOT
Matthews, David Robert	SLR
Malone, William Joseph	SLR; VBW; FRF
Mitchell, Donald H.	FRF
Macauley, Theodore C.	JMA
Montijo, John Gregory	FRF
Meixner, Howard F.	WAC
Mapes, Gordon Walter	SLR
Marshall, Furber Ingram	SLR
Marshall, William Jefferson	SLR
Miller, Marion Lewis	SLR
Moore, Harold Amos	SLR
Moores, Kenneth Albert	SLR
Manning, Lucius	SLR; FRF
Martel, Alfred, Jr.	SLR
Mason, Chauncey Carey	SLR
Moore, David Harris	SLR; EOT
Maynard, Kenyon Cushing	SLR; AAD
Mulcahey, Edward Patrick	SLR; LDT
Mulvihill, Bernard Hampsey	SLR; DIK
Muckley, Robert Latour	SLR
Morsch, Jesse Julius	SLR
Moore, Charles Chilton	SLR
Mills, Robert Rourke	SLR
Meehan, Timothy E.	TFT
Moffat, Reuben C.	TFT
Mennies, Michael	SLR; KST
Meyers, Harold	TFT
Munchhof, Theodore Joseph	SLR; RSD
Marsh, Albert E.	DIK
Massey, Raymond R.	DIK
Meldahl, Carl J.	DIK
Merrill, Kieth B.	DIK
Mess, Robert W.	DIK
Moore, Rush I.	DIK
Morehead, John L.	DIK
Morgan, Stuart A.	DIK
Morris, Edward S.	DIK
Moye, Frank L.	DIK
Mulvihill, Mead J.	DIK
Moody, Corbitt L.	MAC
Meyer, Alfred F.	MAC
Miller, Edward A.	CWT
Minter, Clarke Cothran	SLR; CWT
Murphy, Dan W.	SMM
Malott, Volney T.	Note 10
Mayer, Arthur C.	PFO
Mason, Earnest J.	DIK
Morehead, Joseph H.	DIK
Mahan, William Joseph	SLR; EOT
Metzger, Carlisle Leland	SLR; CWT
Mathews, James C.	PWM
Merrill, George B.	TFT
Minster, Harry T.	TFT
Moran, William J., Jr.	TFT
Marincik, Joseph A.	DIK
Macniel, Bruce	SLR; RSD
Marriott, Charles A.	FLR
Martin, Roland H.	EOT
Meyer, Walter W.	EOT
Midyette, Dayton R., Jr.	DIK
Montagne, Alfred A.	FRF
Metcalf, Frank	FRF
Monteith, Percy L.	FRF
Morrissey, Raymond A.	DIK

Mc

McKinnon, Angus G.	FRF
McMullen, Alexis Brenier	SLR
McCaffery, James A.	FRF
McGrath, Michael F.	DIK
McDaneld, Edward Fletcher	SLR; VBW
McBride, Walton E.	PWM
McAllen, William Daniel	SLR
McCabe, Roscoe Ellis	SLR
McCulloch, John Myers	SLR
McNamara, Laurence Joseph	SLR
McCleary, Frank	SLR; VBW
McNeil, Horace J.	FRF
McIllhiney, Donald W.	FRF
McCaffrey, Aubrey L.	DIK
McVickar, John B.	FRF
McCormack, Ralph Clinton	SLR; CWT
MacWhorter, Robert H.	CPR
McDonough, Hubert Boniface	SLR; EOT
McKinney, Oakley Walls	SLR; DIK
McNaught, Roy Joseph	SLR
MacMechan, Dunbar Dene	SLR
MacRae, Harry Rotsford	SLR
McGrillis, Jacob Wilson	SLR; DIK
McDonald, James Francis	SLR
McHugo, Jack Robson	SLR
McAneney, Earl Raymond	SLR; KST
McDowell, Roy C.	DMA
McGovern, John E.	DIK
McKinzie, Wesley R.	DIK
McCahill, Samuel S.	MAC
McKinnon, John A.	SMM
McBride, Howard Inman	SLR; RWT
McLean, Lucian L.	VBW
McCarron, Henry A.	PFO
McFalls, Edwin L.	PFO
McFerren, Francis A.	DIK
McFarland, William P.	TFT
McKey, Claude D.	TFT
McMurphey, John William	SLR; KST
McGrath, Michael Francis	SLR; GLC
MacDonald, Charles S.	REV
McCabe, Ross	EOT

N

Nunemacher, Francis Warren	SLR
Nigh, Gordon Kincaid	SLR; EOT
Night, William J.	FLR; CDT
Nunn, James Dabney	SLR; KST
Nevin, John, Jr.	PFO
Nott, Sherrard G.	PFO
Nelson, Carl Edward	REV
Naugle, Frank S.	FRF
Nichols, George W.	FRF
Nordin, Oscar	EOT
Nash, Roland Lewis	SLR
Nims, Homer Willis	SLR
Nulson, Norman Lee	SLR
Nunn, William Theodore, Jr.	SLR
Nissager, Fred David Mathias	SLR
Norton, Harrison Edson	SLR; LDT

O

Oliphant, Rufus Alexander	SLR; EOT
O'Shea, Edward Marshall	SLR; AAD
Organ, John David	SLR
Oliver, Phillip E.	FRF
O'Briant, Conrad Luther	SLR
Oliver, Walter Lloyd	SLR; BST
O'Malley, Edward Lewis	SLR
Osborne, Thomas Wesley	SLR
O'Hanley, Myrom Emmett	SLR
Owen, Ross George	SLR
O'Connell, Robert E.	DIK
Olds, Harvey R.	DIK
Ort, Karl S.	DIK
Orsinger, Remington	TFT
Oliphant, Rufus A.	LHV
O'Connor, Thomas F.	PFO

P

Proctor, Willis Heath	SLR; EOT
Pheatt, Merrill Norton	SLR; AAD
Post, John Hawthorne	SLR; RSD

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(*Continued from page* 738)

Potter, James Harold	SLR; EOT
Parsons, Arthur M.	FRF
Parr, Givens A.	FRF
Parks, Ralph O.	PWM
Parmlee, Charles R.	PWM
Pendleton, Albert G.	PWM
Penick, John N.	PWM
Pettingell, John M.	PWM
Pierson, Walter E.	PWM
Pawley, George P.	PWM
Putnam, Kingman W.	PWM
Pattiani, Alois W.	PWM
Pickup, Christopher V.	PWM
Pulliam, Ralph C.	PWM
Pendleton, Archibald F.	PWM
Putnam, Russell Lorain	SLR; BST
Palmer, Hubert Phillips	SLR
Peterson, James H.	DIK
Pearson, Raymond F.	AGC
Paine, Topliff Olin	SLR
Parish, Cheaney Land	SLR
Payne, Bryant Watson	SLR
Prosser, Stuart Alexander	SLR
Pearson, Wallace Drake	SLR
Pratt, Eric Torrens	SLR
Price, Henry Wales	SLR
Patton, Hilton M.	DIK
Peters, Hallam H.	CGC
Pedler, Harry Wesley	SLR; LDT
Peek, Norman W.	Note 6
Parker, Robert M.	TFT
Pascoe, William H.	TFT
Prindle, William D.	DIK
Pinkstaff, Everett Wilson	SLR; KST
Peterson, Ernest J.	TFT
Pond, Richard E.	TFT
Patterson, Walter K.	FLR; VBW
Phelps, Samuel Bixby	SLR; EOT
Paige, William Julius	SLR; EOT
Poleman, Thomas Theobald	SLR; KST
Pilcher, Rufus James	SLR; KST
Pennington, Jerome Edward	SLR; LDT
Prosser, Frank Hallam	SLR; RSD
Parsons, Gustav A.	DIK
Penfield, Charles C.	DIK
Pitts, Younger A.	DIK
Price, Owen N.	DIK
Potter, James H.	PWM
Proctor, Willis H.	PWM
Petrill, John M.	DIK
Patterson, Robert E.	DIK
Phillips, Donald B.	DIK
Peck, Lee H.	PFO
Pursley, Charles A.	SMM
Pardee, Max A.	EOT
Perry, Marney D.	PFO
Pendell, Elmer	TFT
Pope, John B.	TFT
Phillips, Walter P.	FRF
Patterson, Fred R.	FRF
Pfaff, Leo G.	FRF
Pinckney, Gerald J.	LHV
Petree, Lee W.	EOT
Pratt, Eric T.	DIK

Q

Queen, Harold Ellis	SLR; RSD; FRF
Quinlan, Charles Gordon	SLR
Quaintance, Charles Linsey	SLR; EOT

R

Redin, Roy Wilmer	SLR
Robinson, Clarence Abraham	SLR
Robertson, Archie McIntyre	SLR
Reavis, Carlos Loretto	SLR
Richards, Walter Eugene	SLR
Rose, Rolland L.	PWM
Rose, Elmer J.	PWM; FRF
Rose, Glenn Walter	SLR; RSD
Roberts, Francis M.	PWM
Roberts, Fred G.	LHV
Randell, Hugh P.	PWM
Raibourn, Claude	PWM
Rivers, Harold R.	PWM
Roll, Frederick A.	PWM
Rossen, Horace G.	PWM
Ross, Malcolm H.	LHV
Read, James Kempt	SLR; KST
Rooney, James R.	FRF
Rourke, Frederick W.	FRF
Ricciardi, Attilio	SLR; AAD
Riddle, Earl C.	FRF
Rauh, Joseph Anton	SLR; EOT
Rowe, Hiram Hatch	SLR; RSD
Pitrat, Charles Stuart	SLR; LDT
Ragatz, Edward Gray	SLR
Ransom, Harold Browne	SLR
Ratcliffe, Kent E.	SLR
Rechsteiner, Victor Martin	SLR
Reeve, Frederick Jay	SLR
Romans, Edgar Dwight	SLR
Ronan, John Aloysius	SLR
Rowe, Harold Dalton	SLR
Rabbitt, Ora Clyde	SLR
Robinson, Frederick Alfred	SLR
Root, Homer Roice	SLR
Rummel, Jay Arnold	SLR
Ryan, Robert Emmet	SLR
Ratekin, Otis Benjamin	SLR
Royer, Walter Earle	SLR
Ready, James Baird	SLR; GLC
Reilly, Walter Sheridan	SLR; KST
Russell, Franklin Brundage	SLR; EOT
Rohrbach, Charles Henry	SLR; EOT
Reed, Carroll Goffin	SLR; RWT
Robbins, Leo Rosewell	SLR; EOT
Rabenstein, Maurel King	SLR; KST
Robbins, Ralph Brainard	SLR; CRI
Rascovar, Frank James	SLR; Note 2
Roberts, Estill G.	Note 9
Rolleston, Moreton Mountford	SLR; CAF
Riggs, Robert M.	DIK
Royer, James A.	DIK
Robertson, Charles B., Jr.	DIK
Rogers, John P.	DIK
Ray, Harvey T.	DIK
Robinson, Malcolm G.	DIK
Russell, Laurence L.	DIK
Richardson, Elmer Clark	SLR; RSD
Roe, James A.	FRF
Rust, Charles E.	FRF
Rozier, Thomas C.	FRF
Rogers, Frank W.	FRF
Rask, Peters S.	EOT

S

Scott, James Hardin	SLR
Stites, James Walker	SLR
Sweeney, Edward Morris	SLR
Schwartz, Charles William	SLR
Shaw, William Ferdon	SLR
Shine, Ira James	SLR
Sloniger, Eyir L.	SLR
Snarenberger, Burnis Allen	SLR
Spilman, Louis	SLR
Spiner, Louis Harry	SLR
Stedman, Boyd, Jr.	SLR
Stine, Harold Blaine	SLR
Sullivan, Charles Wesley	SLR
Stanford, Frank Curtiss	SLR; RSD
Sanford, Edwin Ware	SLR; PMT
Stewart, John H.	PWM
Swingley, Charles E.	PWM
Stollenwerch, Guy	PWM
Sheffield, Loren C.	PWM
Shull, David R.	PWM
Shorney, George H.	PWM
Speidel, Frank K.	PWM
Stenberg, Bernard A.	PWM
Stuart, George D.	PWM
Swertfager, Florian F.	PWM
Stoffregen, Hugh M.	PWM
Search, Hendrick M.	FLR; CDT
Signer, John W.	FLR; CDT
Sills, Archie L.	FRF
Stevens, Dillon T.	LHV
Schustedt, Frederick N.	FRF
Skagerberg, Rutcher	FRF
Sands, Frank T.	FRF
Sullivan, Charles W.	BST
Swinney, John J.	FRF
Skanse, Peter E.	FRF
Shelton, Carroll E.	FRF
Shaw, James M.	FRF

The Aircraft Investigation

(*Continued from page* 714)

Mr. Hughes opens his hearings at an early hour and they continue until late in the afternoon with but a brief luncheon recess.

From facts placed in the record within the past few days, it is made clear that Mr. Hughes is running down every report of inefficiency, and that he is acting with the thoroughness which brought him into the limelight in the New York insurance investigation. Although many of the facts being adduced will never be given to the public, lest they reach the hands of the enemy, much information which, up to this time has been refused, will be made public.

From evidence bearing upon the efforts of the Signal Corps to give fronts held by General Pershing's men adequate air defense, it has been brought out that there are now at the front 378 aeroplanes bearing the American insignia. These planes are being used by the American aviators who constitute seven squadrons. Few of the planes are of American manufacture.

There are now 1,746 American aviators in France. A large share of this number are ready to go into the air fights, but only 126 have been provided with equipment. There is an equal number of observers and 38,367 enlisted men to act as mechanicians and aerodrome men are at work completing the flying fields to be used by the American forces.

That the training of aviators has progressed with far greater speed than has the production of aircraft is evidenced by the fact that there are in this country today 3,467 trained aviators and 4,922 observers and non-flying officers awaiting orders to proceed to France. The enlisted men, many of whom have finished their mechanical training at the flying schools in this country total 99,001.

It would appear that the capacity of the twenty-seven training schools of this country is approximately 3,500 men. At the present time there are about 3,394 men being trained as aviators at the flying schools and 3,393 at the ground or preparatory schools. About 4,236 men, passed by the examining boards, are awaiting an opportunity to enter the ground schools. There are 1,036 men who are taking advanced training courses in this country perfecting themselves in pursuit, bombing or observation work. About 2,500 Americans are being trained in schools in France, England, Italy and Egypt.

From records brought up to date two weeks ago, it appears that the Aircraft Board ordered 5,300 elementary planes, 2,100 advanced training planes and 11,000 combat planes. The engines ordered comprise 10,200 for elementary planes, 6,692 for advanced planes and 27,300 for combat planes. The program also included orders for 35,913 propellers, 1,077 balloons, 843,735 bombs and thousands of machine guns.

Definite figures of deliveries of aeroplanes and equipment will not be placed in the record of the evidence until later, it is understood. It is known, however, that planes delivered from American factories include 4,365 elementary, 620 advance, 114 combat and 195 experimental. Engines delivered include 6,126 elementary 1,815 advanced training and 1,043 combat. More than 13,863 propellers have been delivered and more than 31,146 machine guns. About 125 balloons are in use.

There will be a thorough investigation of the statement, that the average price of the planes, propellers and parts of an aeroplane is $5,000 and that anywhere from $1,950 and $5,000 more is needed to equip the plane with an engine and its spare parts. Some of the manufacturers are inclined to criticise estimates which make possible a $10,000 airplane, pointing out that there are few automobiles which approach that price. To date $105,000,000 has been spent for complete airplanes, with an additional $11,000,000 for general equipment, including instruments. The total obligations of the Board as of May 23 were $859,839,974.36.

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(Continued from page 740)

Stout, Sidney Allerdice	SLR
Shellstrom, Frank Charles	SLR; EOT
Sullivan, Edward Johnston, Jr.	SLR; Note 7
Smyth, Herbert C., Jr.	PWM
Smith, Charles F.	PWM
Smith, Stanley	PWM
Smith, Rowland M.	PWM
Smith, Henry J.	PWM
Smith, Ernest LeRoy	SLR
Smith, James E.	FRF
Smith, Harold Arthur	SLR
Smith, Thomas J.	LDT
Smith, Paulding	DIK
Smith, Lowell R.	DIK
Smith, George Milan	SLR
Smith, Wesley Leland	SLR; DIK
Schmidt, Edgar August	SLR
Spencer, Henry Wesley	SLR
Spencer, Bonifield Melville	SLR
Spencer, Vernon Wilbur	SLR
Senft, Walter Melvin	SLR
Snyder, Gerald Seemuth	SLR
Saunders, John Monk	SLR
Spang, Joseph Peter, Jr.	SLR
Spellman, Sterling Bartholemew	SLR
Stark, Adolph Frederick	SLR
Stephenson, Arthur Warren	SLR
Still, Leslie Evan	SLR
Swaller, Sidney Robbins	SLR
Shannon, Arthur James	SLR
Sherwood, Lyman Wetmore	SLR
Simpson, George Logan, Jr.	SLR
Steinhauer, Louis Edward	SLR
Stephens, Russell Stout	SLR
Stone, Percy Norwood	SLR
Sullivan, William Simmons	SLR
Swift, Charles Patrick	SLR
Symons, Thomas William, Jr.	SLR
Symonds, Merrill E.	SLR
Silberman, Moe William	SLR; EOT
Sage, Charles T.	Note 7
Stratton George T.	HHN
Storey, Tad	FRF
Sands, Richard E.	Note 7
Stockman, Loy William	SLR; PMT
Sheffield, Frank H.	TFT
Snell, Raymond Charles	SLR; EOT
Schuemacher, Clyde Jacob	SLR; RSD
Sultzer, Norman William	SLR; EOT
Sundstrom, Olof	SLR; EOT
Severson, Thor Juroyal	SLR; RWT
Strawn, Ferdinand M.	DMA
Sandvigen, Gilbert Tobias	SLR; KST
Shepherd, Floyd William	SLR; LDT
Sanders, William C.	DIK
Sargent, Carl A.	DIK
Schuler, Dement	DIK
Shove, John D.	DIK
Sherman, Alzea C.	DIK
Sievering, Philip J.	DIK
Smoot, William B.	DIK
Selff, Robert Elmer	SLR; PMT
Selden, James Kirtland	SLR; EOT
Savage, Clair Rich	SLR; KST
Snyder, Jonathan Lloyd	SLR; KST
Selberg, Arthur Emanual	SLR; KST
Stoffer, Charles Thomas	SLR; RSD
Scharen, Ferdinand W.	SBI
Smith, Charles S.	FLR
Snarenberger, Burnis A.	DIK
Stephenson, Arthur W.	DIK
Schlachter, Henry	EOT
Smith, Joseph Philip	SLR; KST
Schellenberg, Bert C.	DIK
Smith, Frederick K.	DIK

T

Tobin, William Nicholas	SLR; AAD
Tomlinson, Kenneth C.	SLR
Tuttle, Howell Alfred	SLR; EOT
Tillinghast, Harold Alvin	SLR
Trowbridge, James Orr	SLR
Taylor, Frederick Halsey	SLR
Twining, Albert Chester	SLR; FRF; DIK
Tynes, William Fisher	SLR
Thigpen, Arthur Joel	SLR
Tillton, James Frederick	SLR
Thompson, David E.	PWM
Tierney, James V.	PWM; FRF
Timmerman, Lyman S.	PWM
Toober, Bernard J.	PWM
Tripp, Isaac, Jr.	PWM
Treon, Roland G.	PWM
Taylor, Marvin Harold	SLR; KST
Tolles, Raymond Pardee	SLR; PMT
Thomas, William Albert	SLR
Tillisch, William Henry	SLR
Trumbull, Allan T.	FRF
Taylor, Loren E.	FRF
Tobey, Paul Titus	SLR; PMT
Thompson, Franklin Stolt	SLR; RSD
Taylor, Leonard De	SLR
Thomson, Henry	SLR
Ten Eyck, Charles Andrew	SLR; CWT
Taylor, Lloyd James	SLR
Thayer, Raymond Harold	SLR
Thompson, John Faville	SLR
Tracy, Ray Perry	SLR
Tussing, Earl Byron	SLR
Teeter, Charles	SLR
Thigpen, Roy Milner	SLR
Tyler, Bernard Otto	SLR
Thomas, Charles Edmond	SLR; KST
Tomkins, Carlin, Jr.	DIK
Thompson, Herbert P.	DIK
Thorne, Harold W.	DIK
Thompson, Herle A.	DIK
Thompson, Arthur F.	LDT
Thompson, Arthur S.	TFT
Thompson, Franklin S.	LHV
Tupper, Preston Eddy	SLR; RSD
Tipton, Andrew Ralph	SLR; KST
Turner, Wiley Baldwin	SLR; KST
Thomas, W. George	SLR; KST
Tyler, Lee	FRF
Townsend, Frederick De P.	FRF
Thorn, Earl A.	EOT

U

Utley, Charles B.	PFO

V

Verkouteren, John Henry	SLR
Vessey, Burton Floyd	SLR
Voss, Thomas S.	MAT
Volk, Charles Francis	SLR; EOT
Vandermeer, Dick J.	SLR
Van Horn, John Willis	SLR
Vorhees, Garrett Samuel	SLR
Vawter, George W.	FRF
Vance, Earl T.	PWM
Vollmer, Edward C.	FRF
Vause, Norman J.	FRF
Vaden, Ferris Edgar	SLR
Van Kirk, Russell Morris	SLR
Van Gooding, Carlos Clay	SLR
Vance, Alfred William	SLR; CWT
Vincent, Charles R.	WFO

W

Westbrook, Virgil Darst	SLR; AAD
Wilkins, Alfred Emerson	SLR; AAD
Whiteside, Robert Banning	SLR; CAF
Wherritt, Russell	PWM
Wiltse, Sidney L.	PWM
Wilson, Edmond H.	PWM
Wiggen, Mehemet	SLR; KST
Wright, Wilbur Arthur	SLR; PMT
Wiggins, Frederick C.	FRF
Wolcott, Henry N.	FRF
White, Oscar	SLR; KST

Y

York, Philip Simmons	SLR; EOT
Young, Ora Wesley	SLR; PMT
Young, Henry M.	FRF
Young, Russell A.	FRF
Young, George Edward	SLR
Yager, Frank Ralph	SLR
Yocum, Reuben John	SLR

Z

Zimmerman, Wilson S.	SLR; VBW
Zimmerman, Earl Henry	SLR
Ziegler, John Wesley	SLR; EOT
Zabriskie, Charles	PWM

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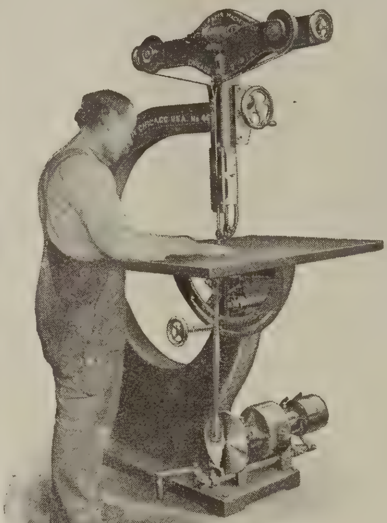

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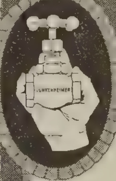

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AERIAL AGE
WEEKLY

Vol. 7, No. 16 JULY 1, 1918 10 CENTS A COPY

A British fighting plane setting out to engage the enemy. (British Official Photo)

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TRANSATLANTIC FLIGHT THIS YEAR

Major-General Brancker Proposes Delivery of American War Planes to Allies Via Air

ON June 21st Major Gen. William Brancker of the British Royal Air Force, who is Controller General of British Air Equipment and a member of the new British Air Council, and who has just come to America to represent the British Air Council, said that the enterprise of a flight across the Atlantic should be undertaken as soon as possible and indicated his belief that it would be accomplished this year. General Brancker said he saw no reason why a large number of aeroplanes should not be sent over the Atlantic next year to be delivered under their own power, and thus meet part of the difficulty of ship shortage in the transportation of aeroplanes to the fighting front.

In response to questions whether he knew of any air pilots willing to undertake such a flight, General Brancker replied:

"I have with me three British pilots who are willing to make the trial. You might say there are four that I know of, as I am myself willing to join in the trial. It is an enterprise that must be carried out as soon as possible. Once this has been established, America's output of big bombing machines can proceed to Europe by air, and so save the shipping that is so invaluable for other purposes. This may seem a wild statement, but we must remember that in 1914 the flight of the English Channel was considered a wonderful and dangerous performance. There is no reason why a considerable number of big aeroplanes and seaplanes should not cross the Atlantic during next Summer, and the sooner that a pioneer proves the flight not only to be possible but comparatively safe, the better can the wonderful resources of America be employed."

General Brancker expressed his conviction that such a flight could be made this year and that the most practicable route would be from Newfoundland to the Azores, then to Portugal and the British Isles or France. General Brancker said the British Government was considering the project seriously and endeavoring to bring about its accomplishment. General Brancker was asked whether the matter had been brought to the attention of the American Government, and replied in the affirmative.

Secretary Baker indicated his approval of what General Brancker had said in favor of attempting a transatlantic flight this year.

"It is a very daring and tempting speculation, and anything that the War Department can do to help to materialize it will be done," said the Secretary of War.

General Brancker expressed the hope that it would be a joint Anglo-American project, in which the personnel for the first voyage might be about evenly divided between the military air forces of the two nations. He said also that there should be about four passengers carried by the plane making the flight, an engineer, a navigator, and a relief of pilots.

General Brancker thought the enterprise could be carried through with motors of 750 horse power, capable of forty hour's flight. The motors should be capable, he said, of eighty-five miles an hour, and when favored by winds, the seaplane should have an added speed of ten to fifteen miles an hour. There were three main problems involved, he thought. These were engine reliability, navigation, and weather forecasting. Engine reliability, he said, would be all right. He was satisfied the Rolls-Royce motor would be able to do it this year, and that the Liberty motor should be able to do it next year. Navigation would be all right also he thought, but weather forecasting was the more important factor, as there was the possibility of the aviator running into bad weather far at sea. General Brancker said that the shortest route, and the one usually suggested, was that via Greenland to Ireland. But this was probably too foggy a route at many seasons. The second projected route was direct from Newfoundland to Ireland. This was a better air route, but would cross an uncertain weather area. The route via Newfoundland to the Azores, he thought, was much the better route for weather conditions. There is a high peak on the Azores that can be seen far at sea in good weather, and which would serve as a guide post to the air pilot. But there are difficulties in establishing an aerodrome for a good landing there, although if the flight was undertaken with aeroplanes fitted as seaplanes in the beginning they could land on the water at the Azores.

Aviation May End Warfare

"The progress of aviation during the last four years," said the General, "has been little short of marvelous, and there is no reason why its progress during the next four years should not be equally so; every day its importance as a factor toward ending the war increases, and it is a branch of warfare in which the Allies should be able to make far more rapid progress than the Germans, whose material resources are far more restricted and whose pilots can never be as good as ours in the air. In a few years the possibilities of aviation as an instrument of war are so appalling that it may force civilized nations, at all events in Europe, to agree to abandon war among themselves altogether. War has been the making of aviation; let us hope that aviation may be the destruction of war."

"America," he said, "has a wonderful opportunity of pushing the advantages of aerial supremacy to the utmost, but her manufacturers must realize that the progress of aviation has been very rapid and will be very rapid, and that, therefore, they must face continual interruption in standard production in order to produce aircraft of higher and higher quality and performance."

Aero Club Makes Negotiations Public

Following the announcement that Major Gen. William Brancker of the British Royal Air Force had come to this country to arrange for military aeroplane flights from this country to Europe, to pave the way for sending Amerian aircraft abroad on its own power, the Aero Club of America made public its negotiations with manufacturers to attempt an early transatlantic flight. One of the proposals of the Aero Club was made to William H. Workman, representing the Handley-Page machine, who accepted at once.

The Aero Club officials were surprised to find that the aeroplane manufacturer thought the matter of sending a plane across the ocean was so little outside of a day's work that he asked a bonus of only $2,500 outside of the cost of the machine for undertaking the trip from this country to Europe. The Aero Club had earlier found an indication that the opinion was general that the flight was sure to be accomplished without great delay when they made inquiries at Lloyd's in London as to their willingness to insure a prize of $150,000 which the club planned some months ago to offer for the first successful transatlantic flight. The reply was that Lloyd's was not prepared to make any bet against the flight being made.

The club submitted its plans for a flight to Lieutenant Belloni, who is in this country as a representative of the manufacturers of the Caproni. He was reported to have tentatively accepted the proposal, and is now preparing terms for the flight by Caproni.

The proposed transatlantic flight of the Curtiss aeroplane America was under preparation when the war started in 1914. Since they developments of aerial navigation devices, as well as the education of air pilots for successful over-water flights, has advanced so that the project presents few of the difficulties which it did in 1914. The most difficult problem that was considered as facing the pilot of the America on its proposed trip was that of keeping posted on his latitude and longitude and steering a course so as to avoid great deviations, which might cause him to run out of fuel while on his way to the Azores.

The matter of keeping to a course has been almost entirely solved by the invention of a radio receiving instrument by which it is possible to tell the exact direction from which radio waves are given forth. This has been adapted to aeroplanes, and an air navigator, with an instrument tuned to receive messages from a point in America and a point in Europe, would always be in possession of a fixed point to steer by.

Professor Charles Lane Poor, Professor of Celestial Mechanics at Columbia University, working on the problem at the request of the Aero Club, had invented a so-called "position line indicator," which simplifies some of the other problems of air navigators. The difficulty hitherto for an air pilot has been to make his calculations of position quickly enough to benefit him.

An air pilot who needed to know his distance from a given point, the direction of his flight, the angle of ascent or descent of his machine, his altitude, and other factors necessary in accurately correcting his course, has had to spend several minutes assembling these data separately. By the time they were assembled his machine might be ten or fifteen miles from where it was at the beginning of the calculation, so that the result was necessarily crude. Dr. Poor's instrument is an automatic calculator which finds out all the pilot needs to know about his position, and works out the problem mechanically.

The letter of Alan R. Hawley, President of the club, to Mr. Workman and to Lieutenant Belloni is as follows:

As we stated to you before you went to England three months ago, a group of patriotic people, who were anxious to assist the Government in solving the difficult problems of delivering thousands of aeroplanes overseas and establishing a trans-Atlantic aerial patrol, has offered to order a large Handley Page aeroplane provided you can assume the responsibility of delivering the machine to England by air. Most people feel certain that aeroplanes could be delivered overseas by their own power, and at least three prominent aeronautic engineers and manufacturers have stated that they can produce the aeroplanes capable of flying across the Atlantic.

But, while this belief and this certainty have existed for over a year, the authorities in charge of placing orders did not place orders for machines capable of flying across the Atlantic, and we are still exactly where we were a year ago. Nothing had been done, notwithstanding the fact that there is nothing to be lost and everything to be gained in placing orders for the largest machines obtainable.

Even if they had not flown across the Atlantic, we would today have them to patrol for U-boats, hundreds of miles out at sea, preventing them from sinking our valuable ships and destroying lives and property. We would, in fact, be in a position to meet Germany's threat to declare the United States coast in the danger zone, with confidence that the U-boats would meet with defeat. The only way to make up, if possible, for the failure on the part of the past aircraft administration to act, is to go to it now without delay. Therefore, we would like to hear from you the terms under which you, representing Handley Page, would undertake to deliver one of the largest Handley Page machines to England, Ireland, or France. We would like you to give full details regarding the following points:

(1) Will you take an order for a Handley Page machine, you to assume the responsibility of delivering it to Great Britain or France under its own power?

(2) What will be the cost for such a machine?

(3) How much bonus must we pay extra for you to assume the risk and responsibility of having it flown across the Atlantic and delivered by air.

(4) We know that the life of an aeroplane is approximately 600 hours, and the life of motors, provided they are run throttled down, is approximately 500 hours, so that if the machine is flown most of the time under throttled power, the aeroplane will have had little wear and can be used for at least 400 hours more of flying after it has crossed the Atlantic. Can you guarantee that the flight can be made with the motors throttled down four-fifths of the time?

(5) As, next to having the aeroplane, the most important factor is having two good pilots, may we inquire whether you have two suitable pilots? Who are they and has their experience been such that it is likely they would be successful in a flight across the Atlantic?

(6) There are three likely routes for the trans-Atlantic flight—which do you consider most favorable for the first flight?

(7) The entire importance of the demonstration rests on being able to do it again a thousand times within six months and ten thousand times within a year. In other words, would you and your associates be ready to take a large order for similar machines, and how soon could you produce after receiving the order. How many machines of this type could you deliver three months after receiving the order? What increase could you guarantee in production each month thereafter, provided an order is given for all that you can produce and there is no interference with the production and no change in the designs?

(8) We appreciate, of course, that very large machines, like the Handley Page and the Caproni, do not grow old in design. They can always be used for bomb dropping at night, when they cannot be seen in the air, and they can carry on aerial operations against the enemy bases and railroads and can conduct a continuous campaign of destruction against the bridges on the Rhine, which are crossed daily by hundreds of trains loaded with German troops and munitions. If it were possible to wreck them and keep them wrecked, Germany would be unable to supply her forces in France and Belgium. Therefore, there should be no delay in building large machines—the larger the better. We have had too much delay in this respect, and the cause of the Allies is suffering therefrom.

We also appreciate that, had we hundreds of large aeroplanes capable of flying 1,500 miles without stopping, the U-boats would not dare to attack to attack shipping along the American coast, or anywhere between the American coast and the Azores—in fact, anywhere, because these aeroplanes could strike at the U-boats everywhere. It is only a question of number. Our Allies have found that everything is possible with large aeroplanes, but they cannot get a sufficient number to cope with the situation. America has tremendous resources which are practically unused and untouched, and can produce thousands of these large aeroplanes.

We will appreciate your answering this letter as fully and quickly as possible. Upon hearing from you we will consult with the authorities in Washington and secure from them the permission necessary to permit you to go ahead building these aeroplanes and to make the flight across the Atlantic at the earliest opportunity.

Six Ways to Cross Ocean

Henry Woodhouse, a Governor of the Aero Club, said that there were three routes for a transatlantic flight and six ways in which it could be attempted.

"The first," he said, "is by means of large aeroplanes capable of flying 3,000 miles from this country to Ireland without stopping. The construction of such planes is considered possible by prominent aeroplane manufacturers. These aeroplanes would fly at a great height and take advantage of the trade winds. Their speed would be about 100 miles an hour, and they could make the trip in about thirty hours.

"The second way would be by means of flying boats or hydroaeroplanes starting from New York and flying to Ireland, stopping to take fuel from ships every 300 miles along the route. These would be ships following their usual course across the Atlantic. The aeroplane pilot should know the route and approximate speed of the ships leaving the harbor, and the ships should expect a possible visit from an aeroplane,

"The third plan would be by land planes, large or small, starting from Newfoundland and flying to Ireland, a distance of 1,800 miles, without stopping. The constructiong of aeroplanes capable of doing this is considered easy by prominent manufacturers. These would also fly at high altitudes and would be assisted by the trade winds. Such a flight might be done under twenty hours.

"The fourth plan would be by flying boats or hydroaeroplanes starting from Newfoundland and flying to Ireland, 1,800 miles, taking on gasoline from ships at intervals of about 300 miles along the route.

"The fifth would be a flight by land aeroplanes, large or small, from Newfoundland to the Azores, 1,195 miles, and from the Azores to Portugal, 850 miles.

"The sixth would be by means of hydroareoplanes flying from Newfoundland to the Azores and from the Azores to Ireland, taking on fuel from ships 200 miles apart along the route."

In a statement issued by the Aero Club of America, regarding the plans for the proposed transatlanic flight, Mr. Alan R. Hawley, President of the Club, said:

"The plan to fly across the Atlantic has reached the practical stage of development where it is only a question of deciding which of the four types of available aeroplanes to use in the first flight.

The Aero Club of America officials agree in every way with the statements of Major General William Brancker regarding the feasibility of making the transatlantic flight this coming September.

General Brancker's Extensive Experience

Being Controller General of Air Equipment of the British Air Ministry and having been Deputy Director General of Military Aeronautics, and having had extensive practical experience in actual flying and training of aviators for the past two years, he knows what he is talking about. He knows the problems of flying across the Atlantic, the types of machines available in England, France and Italy to make the flight, and knows that there are scores of tried and tested aviators ready and anxious to make the flight.

Two of the four types of aeroplanes which can be used to make the flight are American made. One has been offered to the Aero Club by Captain James V. Martin the veteran aviator and aeroplane constructor, of Elyria, Ohio. Captain Martin, who is a master mariner and member of the United

States Naval Auxiliary Overseas Force has submitted a very scientifically worked out plan, proving by actual figuring why his aeroplane can fly across the Atlantic without stopping.

It is well to state here that plans of the Committee of the Aero Club which has had charge of developing the plans for the transatlantic flight for the past four years, show that there are seven different ways and five routes for the transatlantic flight. The Club has had plans submitted for every one of these plans and for each of the routes, and for every type of aircraft, lighter as well as heavier than air.

For obvious reasons the plan to fly across the Atlantic by using the southern route, from Pernambuco, Brazil, to Cape Verde, Africa, which is only about 2,000 miles, with the Island of St. Paul on the way, and the northern route by way of Labrador, Greenland, Iceland, Faroe Islands, to England, cannot be considered. In each case the flight over water is shorter than by the other routes, but they are not practical at present.

General Brancker points out that it is possible to make the flight by both seaplane and land aeroplane, but for the flight to the Azores he points out, very rightly, that the seaplane will be the best, because it can easily land on the water, while it would be difficult to establish a landing place for a land aeroplane.

The plan proposed by Handley Page is to cross the Atlantic with a large land aeroplane. This is also the plan of Caproni. But in each case, the British and Italian authorities also consider practical the plan to make the trans-Atlantic flight with a seaplane.

The American propositions to cross the Atlantic include a plan to do it with a seaplane of the flying boat type, and several with land aeroplanes.

Because all the propositions considered are good, Mr. Robert J. Collier, member of the Board of Governors of the Aero Club of America, who has been interested in plans to fly across the Atlantic for a number of years, proposes the very interesting plan of having the flights across the Atlantic by the representatives of the different countries take place simultaneously. This would afford a comparative test for the different types of aeroplanes employed, and would make it possible to come to conclusions as to which type is best. If the plans being considered were to be followed in such a test, the flights would be on the three routes mentioned above.

As the main purpose of the trans-Atlantic flight, as stated by General Brancker, is to show the practicability of delivering warplanes in large number from the United States to the Allies, and whereas both seaplanes and land aeroplanes are needed to insure aerial supremacy to the Allies, both on land and sea, everything is to be gained by testing every one of the plans submitted.

The Aero Club of America is co-operating closely with the Government authorities, and every one of the plans are referred to the Government authorities. The Club is only anxious to co-operate in getting this thing done, therefore it is willing to help the Government to do it, or if it would help the Government more to have the Club undertake the entire work, the Club is ready to do it.

THE NEWS OF THE WEEK

Aircraft Will Bomb City July 4

New York is to be bombarded from the air on Independence Day. Ten aeroplanes and two dirigibles will participate in the aerial programme.

While the gigantic loyalty parade arranged by the committee is moving along its designated route the aeroplanes will soar above, dropping copies of "The Star Spangled Banner." In all one million copies will be distributed in this novel fashion from Washington Square north to Seventy-second street.

Rome Gives Ovation to American Flyers

Rome.—American airmen who have been trained in Italian camps and are now starting with Congressman La Guardia to the Italian front were received here with enormous enthusiasm as they marched through.

Other contingents of American aviators will shortly follow the first escadrille.

Britain and France to Buy Liberty Motors

Washington.—Official dispatches from London state that the British Government has given the American Liberty motor every test possible except that of continued operation in the field, and that it passed the tests excellently, the British authorities being highly gratified as well as satisfied.

Great Britain will purchase, it was stated, a large number of the engines, her capacity for turning out 'planes being greater than that for building engines, and the same situation exists in France, which also will receive a large number of the Liberty motors from the United States.

Curtiss Establishes "Square Deal" Department

The Curtiss Aeroplane & Motor Corporation has taken a long stride forward in the development of industrial morale by the establishment of a "Square Deal" department in the Division of Education and Welfare.

The "Square Deal" department is for the benefit of all Curtiss employees, whether in factory or office. Its purpose is to apply the square deal to all employees and to the company itself by removing the causes of any dissatisfaction that may arise, and by placing employees in the position for which they are best fitted.

Any employee who feels that he or she has been unjustly dismissed, overlooked in promotions, assigned to duties for which they are not best fitted, neglected in wage advances or made the victim, real or imagined, of favoritism by foreman or superintendent, may bring complaint to the "Square Deal" department. An investigation is made immediately.

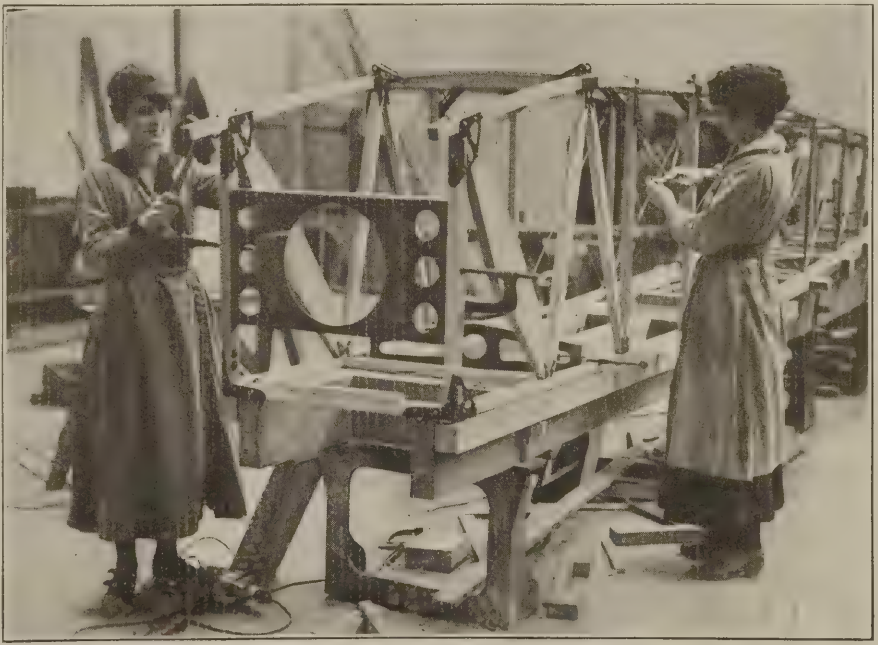
In effect, the "Square Deal" department is a court of appeals. No man or woman may leave the organization, either their dismissal or desire to quit until the "Square Deal" department has reviewed the case.

Disagreements, misunderstandings, complaints of favoritism, and ordinary dissatisfaction result under the old system in a heavy labor turnover. Companies frequently lose workers with capacities which could efficiently be used in some other department. The Curtiss "Square Deal" department thus serves the company no less than the worker through this extension of welfare activities.

May Reduce Rates of Postage for Air Mail

Because of the success of the aeroplane mail service and the fact that the capacity of the aeroplanes is not fully utilized, a reduction of aeroplane postage rates is under consideration.

Mr. Burleson, Postmaster General, announced that as soon as new regulations could be prepared the postage for aeroplane mail service between Washington, Philadelphia and New York would be reduced to sixteen cents for the first two ounces and eight cents for each additional ounce. He said also that the service had proved so successful that it would soon be extended to Boston.



© Central News
In the British aeroplane factories many women are employed. Here are two trueing up an aeroplane fuselage

Attorney General Takes Step to End Contract-Fee Giving

Attorney General Gregory, June 18, sent to members of the Cabinet, heads of bureaus, and other governmental agencies letting contracts for Government work, the following letter:

"A situation which has arisen in the matter of Government contracts seems to me to require summary action. Owing to the tremendous increase in Government business and the speed with which it must be executed, some manufacturers, because of ignorance or misinformation, have thought it necessary to negotiate with the Government through contract brokers or contingent-fee operators.

Condemned by the Courts

"It follows that the system requires a contractor in making his estimate to load his bid with the contingent-fee item. The courts have universally condemned the contingent-fee contract. The methods employed by the contingent-fee operator are often insidious and reprehensible, and in view of the fact that the average fee is 5 per cent, the resulting cost to the Government is very great:

Step to Break Up Practice

"As a means of breaking up this practice, I have prepared the following form of covenant, which the President requests shall be inserted in all Government contracts:

"'The contractor expressly warrants that he has employed no third person to solicit or obtain this contract in his behalf, or to cause or procure the same to be obtained upon compensation in any way contingent, in whole or in part, upon such procurement; and that he has not paid, or promised or agreed to pay, to any third person, in consideration of such procurement, or in compensation for services in connection therewith, any brokerage, commission, or percentage upon the amount receivable by him hereunder; and that he has not, in estimating the contract price demanded by him, included any sum by reason of any such brokerage, commission, or percentage; and that all moneys payable to him hereunder are free from obligation to any other person for services rendered, or supposed to have been rendered, in the procurement of this contract. He further agrees that any breach of this warranty shall constitute adequate cause for the annulment of this contract by the United States, and that the United States may retain to its own use from any sums due or to become due thereunder an amount equal to any brokerage, commission, or percentage so paid or agreed to be paid.'

"As an additional protection it is requested that your department adopt as a regulation the following language taken from section 3722, page 735, Revised Statutes, as applied to the Navy Department: 'And no person shall be received as a contractor who is not a manufacturer of or regular dealer in the articles which he offers to supply.' This will synchronize the action of officials of your department with that of the contractor who is prohibited by section 3737, Revised Statutes, from transferring his contract or order, or any interest therein, to any other party.

"T. W. Gregory,
"Attorney General."

Review of Aerial Mail Service Operations for First Month

The Post Office Department authorizes the following:

"In the first month's operation of the Aerial Mail Service between New York, Philadelphia and Washington, a total of 5⅗ tons of letter mail was transported. The planes carrying mail covered 11,109 miles and had a total of 157 hours 59 minutes in the air. The average speed through storm and fair weather for the month was slightly in excess of 70 miles an hour. Twenty-one out of 26 flights were completed at Belmont before 4 o'clock in the afternoon, 12 of them being between 2.30 and 3 o clock.

"Lieut. Edgerton has to his credit 20 perfect flights of 130 miles, never having to make a stop en route, and without damaging a plane. Lieut. Culver, flying between New York and Philadelphia, has 13 perfect flights to his credit, never having to stop en route, and having no damage to his plane. Lieut. Webb has 11 perfect flights to his credit. Lieut. Kilgore made 9 non-stop flights and 2 interrupted flights. Lieut. Bonsal made 15 non-stop and 4 interrupted flights, and 1 damaged plane. Lieut. Miller made 11 non-stop flights, 4 interrupted flights, and 2 planes damaged.

American Airmen in France

The following official dispatch from General Pershing was given out on June 20th.

"Last night our aviators were again successful in bombing the railroad yard tracks at Confans."

Ace of Aces Missing

According to a press report of June 20th, Lieut. Frank Baylies, the American Ace of Aces, has been brought down behind the German lines. The last seen of him was when his comrades saw him "peaking to earth with smoke streaming in his wake." One of the Observation Balloons afterward reported that though the plane was on fire, it seemed to flatten out before it touched the ground. There is, therefore, hope that he escaped with his life, although he is a prisoner.

Lieut. G. T. Rowe Missing

Nothing has been heard of Lieut. G. T. Rowe, of the U. S. Air Service since May 30th. He was then seen to descend to the surface of the North Sea for repairs to his engine. Later a carrier pigeon returned from him saying that he had been attacked by three German machines.

Compilations show that the American aviators flying over the Toul sector have made an enviable record. American pursuit units since April 14, when they started operations, have shot down at least thirty-two enemy aeroplanes. Seventeen of this number were seen and officially confirmed by the French, while during the same period only seven of our chaser flyers have been lost.

Of the seven American pursuit pilots who were lost, four were killed—one by accident and two are prisoners in the hands of the Germans.

© Kadel & Herbert

One of the powerful sirens on the roof of one of New York's high buildings that will send forth shrill warnings should German aeroplanes succeed in reaching the metropolis

The Americanized Lafayette Escadrille, which is still attached to the French army, has again covered itself with glory. Particularly has this been the case over the blood soaked slopes of Mount Kemmel.

Nearly every pilot has been decorated by the French, British or Americans, and those already having medals received additional citations entitling them to stars or palms or bars.

Major William Thaw worked indefatigably, downing his fifth enemy aeroplane, thus becoming an "ace" and receiving his fifth palm of the Croix de Guerre.

George Turnure, of Lenox, Mass., now has two palms of the Croix de Guerre for shooting down in flames two German captive balloons behind Kemmel.

Hobey Baker got the Croix de Guerre for bringing down a single seater monoplane within the German lines.

Cord Myer, of New York, also was decorated for daring combat work.

Seth Low received the Croix de Guerre for the part he played in the same engagement, beyond Kemmel.

Monk Hunter, of Nashville, Tenn., was decorated for attacking a two-seater.

Christopher Ford, of New York, shot down in flames a single seater near Ypres, receiving the palm of Croix de Guerre.

Charles H. Biddle, of Philadelphia, attacked an armored two-seater, but was wounded in the leg, while another bullet passed through the motor. He landed in No Man's Land, in the region of Dickebush Lake, escaping from the wreckage of his machine just a minute before the Germans began to pulverize it with their artillery. He received the Croix de Guerre.

Ernest Giroux, of Boston, who has been missing since May 23, drove down out of control a German machine two days previously, and for this he has been cited for the War Cross.

William Dugan, of Boston, after being missed for several hours, returned after chasing a German machine beyond Lille. He has received the palm of the War Cross.

Robert Rockwell, of Cincinnati, fought several German machines, driving one down out of control. He receives the third palm of the War Cross.

Dudley Hill, of Peekskill, N. Y., drove off German machines that were attacking a British observation balloon and later brought down a low flying armored German plane which contained three occupants. He receives the fourth palm of the War Cross.

2 American Airmen Honored in France

Paris.—Captain David McKay Peterson, of Honesdale, Pa., and Captain Kenneth Marr, of San Francisco, have been honored for their recent air victories.

They have just been appointed to the rank of commander of a squadron of American aeroplanes.

More Records Established

Paris.—The French aviators Helaldy and Lorgenat flew with a seaplane carrying 660 pounds of cargo from Paris to London in two hours and forty-five minutes on June 10. The return journey was made in ten minutes less. These are record flights. A regular aerial mail service between the two capitals is expected soon.

Aiding in Aeronautical Work

Suitable sites for additional aerological stations for the observation, measurement, and investigation of atmospheric phenomena in the aid of aeronautics have been selected by the Weather Bureau at Broken Arrow, Okla.; Ellendale, N. Dak.; Groesbeck, Tex.; Leesburg, Ga.; and Royal Center, Ind. This was done under the Army appropriation act for the year ending June 30, 1918, authorizing $100,000 for this purpose. Installation of equipment has been completed at the Ellendale station and daily free air observations are being obtained. It is expected that free air observations will be begun at the other four stations about July 1.

Aerial Gunnery School

Gerstner Field, Lake Charles, La.—The many aviation students from New York City and vicinity now training here are fast completing their course in aerial gunnery.

This "finishing school," as it is called, is the first of its kind in the United States, and aviators from all over the country are here for the training course.

The students easily discern the striking of bullets on the water and are able to correct their fire almost instantly if the shots go wide. The results, instructors say, are more than gratifying.

Before being sent to the camp the students are required to undergo a course of ground schooling near here. From Gerstner Field they go to the lake, and in classes of thirty are put to work on the "Taube" and a small aerial target released at an altitude of about 3,000 feet. The students are graded according to their proficiency in firing, and when they make the percentage of hits required are discharged from the school.

Anti-Aircraft Guns for City

Washington.—That the possibilities of German submarines carrying seaplanes reaching American waters are recognized by the War Department became known when it was disclosed that the House appropriations committee is giving consideration to defense against possible raids by air.

The sub-committee, among other things, is considering estimates submitted by the War Department for a large number of anti-aircraft guns of the 4.7-inch type. The plan is to establish such guns at points along the Atlantic coast where they might be useful in repelling air raids.

From the Flying Fields

Kelly Field's big stadium and athletic field will be dedicated July 4 when athletes from 22 camps in the Southern Department will compete in a monster track and field meet.

The stadium will have a seating capacity of 20,000 persons. The site is a 25 acre tract of land, the gift of D. J. Allen of San Antonio, Texas. The structure will be oval, surrounding the field, and will be built in movable wooden sections. Next month a swimming tank will be constructed, tennis courts built, and outdoor athletic paraphernalia installed.

An excellent quarter of a mile cinder track, inside of which are two baseball diamonds have been laid out. The work of construction is well under way and will be completed before the day of the meet. Approval for the project is expected from Washington.

Wireless News to be Received at Kelly Field

The news of the day is to be supplied to the officers and men of Kelly Field by wireless.

Lieut. K. M. Manookin, head of the radio school of the Kelly Field Flying Department, announces that news bulletins and weather reports are to be received daily at the new radio station. These reports will be posted on bulletin boards all over the field. They will come from every wireless station within the radius of the Kelly Field station.

Must Use Clothes U. S. Prescribed

Washington.—Use of the standard cloths prescribed by the Quartermaster's Department for officers' uniforms will be compulsory, irrespective of whether the officers have the uniforms made through the department or by private tailors, it was authoritatively stated at the War Department on June 17th.

There will be nothing to prevent the officers having their uniforms cut by their own tailors; but they will be compelled to confine themselves to the standard cloths prescribed by the department.

Naval Aviator Does 109 Straight Loops

Looping 109 successive times with a hydroplane at the Marine Flying School, Miami, Fla., Lieut. F. L. Fleer established on June 7 what is probably a new naval record. There are instances where military fliers looped more than 100 times, but Lieut. Fleer, it is believed, is the first to do it with a hydroaeroplane.

Machine Tests "Rebreathing" of Air Cadets

Ft. Worth, Texas.—By a "rebreathing machine," the first of its kind to be established by the United States Government or any of its Allies anywhere, aviators flying under the Stars and Stripes henceforth will be classified according to their ability to thrive in high altitudes.

The machine is in a research laboratory at Barron aviation field, and is in charge of Lieutenant G. H. Hanson, F. W. Thomas and James Blair. It produces all the sensations of ascending and descending, and has been in use by the German air service, it is said, for five years.

Henceforth no pilot from any of the local fields will be assigned to active duty overseas until he has passed the tests of the contrivance and been classified according to his ability to withstand altitude fatigue.

The pilots will be divided into three classes. In the first class will be placed airmen who are never affected by altitude fatigue and who can ascend and fight anywhere their planes will mount.

In the next class will be those whose mental faculties are dulled by high altitude.

In the last, or third, will be those who faint under the stress.

Captain D. McK. Peterson, a young Princeton graduate, who is giving an excellent account of himself with the American Air Service in France

To Train Carrier Pigeons

Kelly Field, San Antonio, Texas, has commenced the training of carrier pigeons. One hundred and fifty birds have been received to start with. They will be taken up in aeroplanes and, after messages have been attached, they will be thrown from the machine. They will be trained gradually to return to their specially constructed loft where when a bird enters, a bell rings. The flight of each bird will be timed and only those which show ability to fly straight home will be kept for breeding purposes.

The training will be in charge of Sergeant Oscar A. P. DeVaux, 615th Aero squadron, who acted as the head of this branch for the Belgians at the beginning of the war. Lieutenant W. C. Couch, assistant-adjutant, will supervise the training.

Chanute Field News

Reveille hour has been changed so that now the occupants of Chanute Field tumble out of bed at four thirty A.M., and the flying starts at 5:50. The teaching of formation flying has been started. The Bloomington Chamber of Commerce has constructed a flying field close to the city for the fliers from Chanute Field to use. They have erected a flagpole in the center of a fifteen foot circle to show the direction of the ground wind. The circle is easily visible at 1,500 feet up. Under the recent order of the Director of Military Aeronautics the non-flying officers of the Field are being taught to fly.

Lewis Gun First

London.—In the House of Commons J. I. MacPherson, Under-Secretary of the War Office, reported for the committee appointed to test various machine guns. He said the committee had placed the various guns examined in the following order:

First, Lewis.
Second, Light Hotchkiss.
Third, Madsden.

The decision was unanimous.

American Airmen in France

A despatch from the Headquarters of the Italian Army dated June 23 says: Lieutenant Clarence Young, of the American Aviation Forces, while making a flight was compelled to descend within the Austrian lines. His comrades who saw him make the landing assure Headquarters that he was not injured.

According to *La Liberte*, American aviators on the night of June 22-23 carried out an aerial raid on German territory, when they bombed Metz-Sablons station and started a big fire.

Moving Pictures from Aeroplane

The Rivoli Theater on June 23 introduced a new form of bill when it gave a number of reels showing the American aviators training at Miami, Fla. These became thrilling when there was shown a series taken by Q. M. S. John M. La Monde, U. S. M. C. These pictures were taken while the aeroplane in which the camera was mounted did a series of loops, sideslips and nosedives.

French "Ace" Ends Flight from Canada

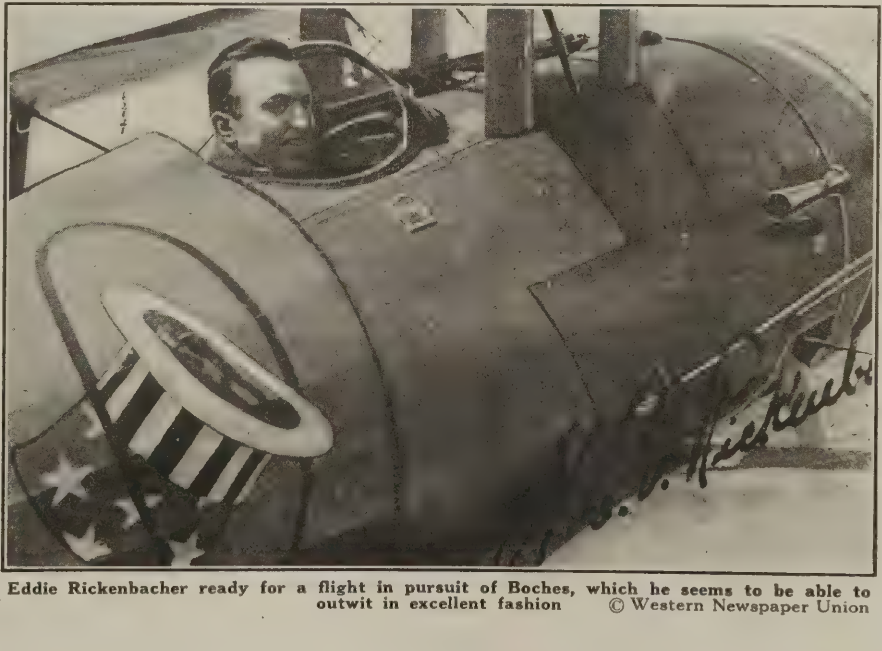
Lieutenant Georges Flachaire, the French "Ace," who left Montreal, Canada, on June 19, arrived at Cleveland on Sunday night, June 23. He made two stops, one at Buffalo of two days, and one at Erie for one day.

Lawn Fête for Aviators' Athletic Fund

A lawn fête will be held on July 6 at Mr. Mortimer L. Schiff's country home, Oyster Bay, Long Island, for the purpose of raising funds to provide athletic equipment for the training stations of aviators. One hundred and fifty aviators are expected to be present. The fête will be followed by a dance. The visiting aviators will be entertained for dinner at numerous nearby country homes and then motored back for the dance. Mrs. Charles A. Van Rensseler is in charge of the arrangements. Mrs. Edward McKenna is chairman of entertainment. Other women interested in the entertainment are: Mrs. Thos. Hitchcock, Mrs. John S. Phipps, Mrs. Henry H. Duryea, Mrs. Patrick A. Valentine, Mrs. John Willys, Mrs. French Vanderbilt, Mrs. Charles S. Whitman, Mrs. E. Henry Harriman, Mrs. William E. Benjamin, Mrs. Horatio N. Slater and Mrs. Marshall Russell.

Ten New Flying Fields for Long Island

Mineola, L. I.—Because of the limited space open for landings on the flying field here, the Government will establish ten new aviation training stations in different sections of Long Island.



Eddie Rickenbacher ready for a flight in pursuit of Boches, which he seems to be able to outwit in excellent fashion © Western Newspaper Union

The AIRCRAFT TRADE REVIEW

N. E. J.

Gasoline Tax Rumors Untrue

Washington.—Reports that a high tax on gasoline used for passenger cars and motor trucks will be placed in effect in July or August, 1918, are untrue. These reports, published by papers throughout the country, are the result of a speech made in Congress advocating such a tax. There has been no bill prepared for it.

To Increase Spruce Production

Washington.—Production of spruce for aeroplanes will be increased by the addition of 9,000 workers to the present ranks. Provost Marshal Crowder sent out a call for 9,000 limited service men of draft age. These men will be sent to the Northwest.

Big Liberty Plane Production in Detroit

Detroit.—Detroit is producing 92½ per cent of all Liberty engines contracted for and at least one-third of the battle plane supply, according to a statement issued by the Detroit Real Estate Board. It is estimated that 19,000 Liberty engines will be completed in Detroit before Sept. 1, the contract time. It is also estimated that within 4 months Detroit will be producing not less than 50 complete battle planes daily.

May Stabilize Oil Price

Washington.—Measures to stabilize the price of crude oil may be adopted by the Oil Division of the Fuel Administration. Mark L. Requa, Oil Director, has asked the national petroleum war service committee to co-operate with him in the development of a plan which will stimulate maximum production and give reasonable earnings.

The Fuel Administration authorizes publication of the following:

"Owing largely to the press reports regarding the action of the War Industries Board in taking over the entire steel production of the country for Government requirements and not making clear the point that the term 'Government requirements' included all essential requirements not ordered directly by the Government for Government use, a wrong impression has been created in the minds of consumers, such as oil producers, for instance, and they seem to think that the action of the War Trade Board is going to have the effect of curtailing and even shutting off completely the supply of these essentials, and this has resulted in more or less of a scramble to cover their requirements on orders in excess of their real needs and also in the hoarding of materials, which, in its turn, results in inequitable distribution and profiteering in price.

"The effect of the action of the War Industries Board should be exactly opposite. The taking over of the steel production by the Government and the allocation of that tonnage to essential industries only is calculated to increase greatly the supply of essential products, and, of course, the production of oil and gas and of all kinds of oil well supplies used in that production or in the pipe line transportation of same has already been classed by the War Trade Board as highly essential to the Government program in the prosecution of the war; therefore, their action is going to be a very great assistance in immediately relieving the shortage that has existed in a few items, such as wire rope, tubular goods and boilers.

"At the same time is should be thoroughly understood that every pound of steel or other essential commodity that is diverted from use in the building of ships, aeroplanes, and munitions has a proportionately retarding effect upon the completion of the Government's program, and therefore no truly patriotic citizen will consume these valuable commodities wastefully."

U. S. A. Steel Propeller

The American National Advisory Committee on Aeronautics is inviting engineers to give their attention to the question of producing a steel air-screw of variable pitch. The first requisite is for a propeller which will enable an engine to maintain constant speed at all altitudes, while the second requisite is that the air-screw be constructed of steel, because it is believed that this will be the ultimate material for propellers. Designs, photographs, and brief descriptions should be sent to the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C.

New Mechanics Handbook

Fred H. Colvin has just completed his "Aircraft Mechanics' Handbook" of 402 pages and 193 illustrations.

This book represents what the author believes to be the best practice known at this time in the aeroplane industry and contains many suggestions which are valuable to the aircraft mechanic. The purpose of the book is to make the facts available to the aircraft mechanic and inspector in the shortest time.

Motor truck and aeroplane trailer at one of the French aviation centers
(French Official Photo)

The first part of the book deals with the construction of the aeroplane and its theory. One chapter is devoted to the S. A. E. aeroplane standards. The materials that go into the aeroplane are discussed. The author gives several chapters to detailed description operation and characteristics of various types of engines. Following this is a chapter on notes and instructions to Government inspectors of aeroplanes and aeroplane engines. Specifications describing the design, construction, equipment and requirements, of a military aeroplane adapted to advanced school instruction in land flying are included. The details, dimensions and the method of assembly of training planes follow. A long and interesting section describes the methods of training used at Camp Borden, Ontario, Canada. It also includes a description of the camp. The instruments and accessories such as the tachometer, clinometer, banking indicator and Lewis machine gun are taken up carefully. The last two sections are composed of useful tables, diagrams and terms used in aeronautics. This book can be secured at the Aeronautic Library, 280 Madison Ave. Price, $3.20 postpaid.

Balloon for Propaganda Distribution in Germany Gets Tryout at Omaha

Omaha, Neb.—Colonel Hersey, commander at Ft. Omaha Balloon School, stated that the first flight of a new balloon to be used in spreading propaganda in Germany was a success. The balloon is equipped with a clock device to distribute circulars. The first balloon was sent away June 6 and distributed Red Cross circulars all the way to Elmo, Mo.

Colonel Hersey said more tests will be made before the balloons are sent to do their work of "peddling the truth" to Germans.

Templeton Director of Industrial District

Detroit.—Allan A. Templeton, former president of the Detroit Board of Commerce, and president of the Detroit Seamless Steel Tubes Co., has been made director of the Detroit industrial zone. He will have general supervision of the production of war materials in this zone. Detroit is the center of one of the 20 zones into which the United States has been divided by the War Industries Board, for the purpose of facilitating the manufacture of munitions. The limits of the Detroit zone have not been announced.

Personal Pars

Archer A. Landon, vice-president of the American Radiator Co. and well known in the manufacturing world, is now head of the Production Division of the Aircraft Production Board. More than 20 years ago he joined the American Radiator Co. as a machinist and after a few years was appointed manager of the smaller plants. Later on his promotions made him assistant general superintendent of plants. Three years ago Mr. Landon was elected vice-president of the company in charge of production.

F. B. Stearns, chairman of the board of directors of the F. B. Stearns Co., is president and treasurer of the Stearns Aero Parts Co., recently organized in Cleveland, O.

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NATIONAL ADVISORY COMMITTEE PRESENTS THIRD ANNUAL REPORT

THE third annual report of the National Advisory Committee for Aeronautics, reviewing the activities, and embodying much of the scientific work of the committee to June 30, 1917, has just been made public. It includes a message of the President announcing the transmission of the report for the consideration of Congress. The President states that the estimates of the committee, together with its plans to enlarge facilities contemplated through its laboratories and scientific staff at Langley Field, outlined in the closing paragraph of the report, have his hearty approval.

The report reviews the activities of the committee during the past year, the work accomplished in the study of scientific problems, the assistance rendered by the committee in connection with aerial preparedness for war, and in the development of the aircraft industry to meet the demands of the Government, and contains a statement of expenditures, estimates for the fiscal year 1919, and certain recommendations for the consideration of Congress. Technical reports covering the various subjects under investigation during the past year are submitted as appendices.

The National Advisory Committee for Aeronautics was established by Congress by an act approved March 3, 1915. Under the law, the committee is charged with the supervision and direction of the scientific study of the problems of flight, with a view to their practical solution, the determination of the problems which should be experimentally attacked, their investigation and application to practical aeronautics. The committee is also authorized to direct and conduct researches and experiments in aeronautics in such laboratory or laboratories as may be placed under its direction.

Personnel of the Committee

The committee has twelve members, appointed by the President. As authorized by Congress, the personnel of the committee consists of two members from the War Department, from the office in charge of Military Aeronautics; two members from the Navy Department, from the office in charge of Naval Aeronautics; a representative each of the Smithsonian Institution, of the United States Weather Bureau, of the United States Bureau of Standards, and not more than five additional persons acquainted with the needs of the aeronautical science, either civil or military, or skilled in aeronautical engineering or familiar with the allied sciences.

During the past year the two naval members of the committee, Capt. Marks L. Briston, U. S. N., and Naval Constructor Holden C. Richards, U. S. N., resigned on account of transfer to duty away from Washington, and Brig.-Gen. Geo. C. Scriven, U. S. A., resigned on account of retirement. To fill the vacancies thus occasioned the President appointed the following members: Rear Admiral D. W. Taylor, chief constructor, U. S. N.; Lieut.-Com. J. H. Powers, U. S. N.; Lieut. Carter V. E. Clark, Signal Corps. Dr. S. W. Stratton succeeded Naval Constructor Richardson as secretary. The annual meetings of the Advisory Committee are held in October and the semi-annual meetings in April.

For carrying out the work of the Advisory Committee the regulations provide for the election annually of an executive committee to consist of seven members. The executive committee, as organized on Oct. 9, 1917, is as follows:

Dr. Charles D. Walcott, chairman, secretary Smithsonian Institution.

Dr. S. W. Stratton, secretary, director Bureau of Standards.

Dr. Jos. S. Ames, Physicist, Johns Hopkins University.

Prof. Charles S. Marvin, chief U. S. Weather Bureau.

Dr. Michael I. Pupin, physicist and electrical engineer, Columbia University.

Maj.-Gen. Geo. O. Squier, chief signal officer U. S. Army.

Rear Admiral D. W. Taylor, chief constructor U. S. Navy.

Dr. W. S. Durand, chairman National Advisory Committee for Aeronautics, additional member.

The executive committee held monthly meetings throughout the year, and thirteen special meetings in addition.

Great Variety of Work

A good idea of the variety of the work that is being carried on by the committee may be obtained from the following list of sub-committees. It should be pointed out that the membership of sub-committees is not limited to members of the advisory committee:

Aerial Mail Service, Maj.-Gen. Geo. O. Squier, chairman; Aerial Torpedoes, Lieut.-Com. J. H. Powers, chairman; Aircraft Communication, Dr. Michael I. Pupin; Aeroplane Mapping Committee, Maj.-Gen. Geo. O. Squier, chairman; Bibliography of Aeronautics, Prof. Charles F. Marvin, chairman; Buildings, Laboratories and Equipments, Dr. S. W. Stratton, chairman; Civil Aero Transport, Dr. W. S. Durand, chairman; Design, Construction and Navigation of Aircraft, Maj.-Gen. Geo. O. Squier, chairman; Aeronautic Instruments, Dr. Jos. S. Ames, chairman; Editorial, Dr. Jos. S. Ames, chairman; Foreign Representation, Dr. Chas. D. Walcott, chairman; Free Flight Tests, Prof. John F. Sayford, chairman; Governmental Relations, Dr. Chas. D. Walcott, chairman; Helicopter of Direct Lift Aircraft, Dr. W. S. Durand, chairman; Nomenclature for Aeronautics, Dr. Jos. S. Ames, chairmen; Patents, Dr. Chas. D. Walcott, chairman; Policy, Prof. John F. Sayford; Power Plant, Dr. S. W. Stratton, chairman; Quarters, Dr. S. W. Stratton, chairman; Radiator Design, Naval Constructor H. D. Richardson, chairman; Relation of Topography to Aeronautics, Prof. Chas. F. Marvin, chairman; Sites for Experimental Fields, Dr. Chas. D. Walcott, chairman; Special Committee on Engineering Problems, Dr. W. S. Durand, chairman; Investigation of Materials, Dr. S. W. Stratton, chairman; Light Alloys, Dr. G. K. Burgess, chairman; Steel Construction for Aircraft, Dr. W. S. Durand, chairman.

Office and headquarters of the committee are located in rooms 515-519 Munsey Building, Washington, D. C. Its technical work is carried out in various laboratories and shops belonging to the Government and to universities. To carry out the highly scientific and special investigations contemplated in the act establishing the committee the latter has contracted for a research laboratory to be erected on the Signal Corps Experimental Station, Langley Field, Hampton, Va. This will be a two-story, red brick building, 126 x 52 ft. in dimensions. Among the departments of the laboratory will be a machine shop with structural testing laboratory, pattern shop, executive offices, drafting rooms, photographic, physical and chemical laboratories. There is also room for two wind tunnels which are contemplated for the near future, and engine-test sheds will be erected in a convenient location.

Situation First Reviewed in March, 1917

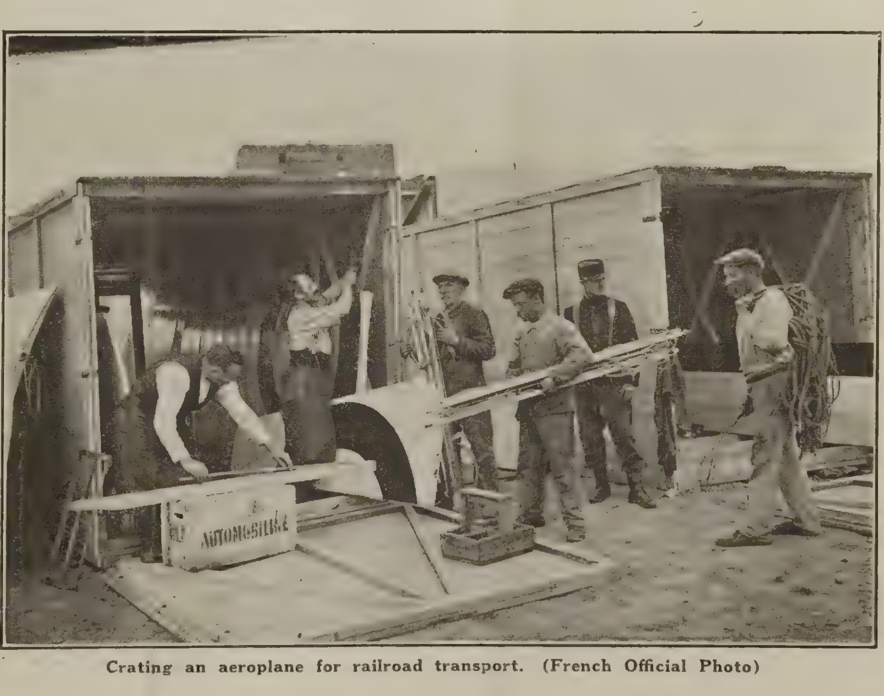
In the latter part of March, 1917, when war with Germany seemed imminent, the committee reviewed the condition of the aeronautic industry, the facilities then existing in this country for meeting the requirements of the Government, the possibilities of adequate expansion, and the then patent situation and its influence on the aeronautic industry. A sub-committee was appointed to co-operate with representatives of aircraft manufacturers and to investigate all problems relating to quantity production of aircraft for the Government. After careful study, the Advisory Committee submitted recommendations to the War and Navy Departments for increasing production and for the adoption of a program covering the next three years.

Early in April the chairman of the Executive Committee recommended to the Council of National Defense the appointment of an Aircraft Production Board, whose duties would be to consider and deal with problems arising in connection with quantity production of aircraft. The committee had previously undertaken a census of the production facilities of manufacturers of aircraft and aeronautic instruments, and this information was made available to the Aircraft Production Board. Another recommendation made was the appointment of a joint technical committee of the army and navy for determining specifications and methods of inspection for all aircraft requirements for the two services.

The committee took the initiative in organizing ground schools for the preliminary training of aviators and in determining the curriculum and methods of carrying on this instruction. A special commission was sent to Canada to study the methods of training at the Camp Borden Military School of Aeronautics at Toronto. On recommendation of the committee the War Department selected the following six colleges for the establishment of ground-school training in aeronautics: Massachusetts Institute of Technology, Cornell University, Ohio State University, Illinois University, University of Texas and University of California. Later, Princeton University and Georgia School of Technology were added. In May, 1917, the committee suggested that flying fields be named in commemoration of individuals who had rendered conspicuous service or contributed to the development of aeronautics, and that aviation schools established in Dayton, Ohio, Champaign, Ill., and Detroit, Mich., be named in honor of Wilbur Wright, Octave Chanute and Lieutenant Selfridge respectively. In response to requests from the War Department the executive committee gave it as its opinion that all parties and Governmental agencies connected with the development of the air service were co-operating in an efficient manner, and that nothing would be gained by the establishment of a Department of Aeronautics. It was on the recommendation of the committee that the Manufacturers' Aircraft Association was formed early in 1917. In March, 1917, Dr. J. S. Ames, a member of the committee, was delegated to accompany the National Research Council on its trip abroad, with the object of obtaining detail information on scientific matters relative to the war.

In order to further develop contact with the service of information abroad several members of the British Royal Flying Corps and the French Air Service were appointed associate members. The committee also co-operated with the War Department in bringing sample forms of aeroplanes from Europe for use in developing new designs here.

(*Continued on page 796*)



Crating an aeroplane for railroad transport. (French Official Photo)

AERONAUTICS DOMINATE S. A. E. SUMMER MEETING

Engineers at Dayton Devote Major Part of Time to Discussion of Aeroplanes, Aero Engines, and the Aircraft Program

THE Summer Meeting of the Society of Automotive Engineers, held at Dayton, June 17-18, proved conclusively that the questions receiving major attention at the present time are aeronautical. Nearly three-quarters of the big convention pavilion in the midst of the 450-acre park was filled with aeroplanes, engines, parts of wings, etc. There were 1,200 members and guests in attendance, and all were enthusiastic about the arrangements and program. A general idea of the latter may be had from the following schedule:

Saturday, June 15:

10:00 A.M. Meeting of eight divisions of Standards Committee at Dayton Engineers Club.

Sunday, June 16:

10.00 A.M. Meeting Standards Committee, Dayton Engineers Club.

1:00 P.M. Meeting S. A. E. Council, Dayton Engineers Club.

8:00 P.M. Section Conference, Dayton Engineers Club.

Monday, June 17:

9:00 A.M. Registration and Badges, entrance Triangle Park.

9:30 A.M. Exhibits in meetings pavilion.
- a—Aeroplane Engines
- b—Aeroplane Wings & Parts
- c—Liberty Engine & Parts

10:00 A.M. Business Session. Meetings pavilion.
- a—President remarks
- b—Treasurer's report
- c—Membership Committee's report
- d—Section Committee
- e—Publication Committee
- f—Election Nomination Committee
- g—Const. amendments
- h—New business
- i—Standards Committee report

12:30 Noon. Luncheon, dining hall, Triangle.

1:15 P.M. Machine firing through propeller.

1:30 P.M. Petroleum refining, paper and demonstration. C. W. Stratford.

3:00 P.M. Heavy oil engines for automotive purposes.
- a—S. E. Sargent
- b—P. L. Scott

4:00 P.M. Aeroplane demonstrations over park.
- a—Aeroplane raid on trenches
- b—Formation flying
- c—Stunt flying
- d—Manuevers
- e—Bombing.

Opportunity for examining engine and plane exhibits in meetings pavilion.

7:00 P.M. Orville Wright dinner, dining hall in Triangle Park.

10:00 P.M. Movies in front of baseball stand, Triangle Park.
Possibly illuminations.

President Kettering, of the Society of Aeronautic Engineers.

Tuesday, June 18:

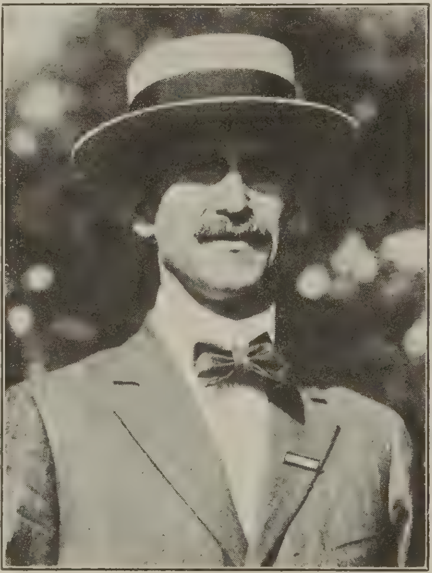
9:00 A.M. Meetings pavilion open for examination of aeroplane engines, planes and Liberty engine exhibits.

9:30 A.M. Demonstration Mfg. machine in Triangle Park.

10:00 A.M. Address, Propeller design—F. W. Caldwall.

10:20 A.M. Address, present day problems in aeronautics—W. B. Stout.

10:50 A.M. Address, Aeroplanes of today—F. L. Faurote.



Orville Wright, pioneer aeroplane inventor, who was tendered a remarkable testimonial dinner by the S. A. E.

11:20 A M. Address, Comparison of Aviation engines.
Lewis.

11:45 A.M. Possible report on Liberty engine tests.

12:30 Noon. Luncheon, dining hall, Triangle Park.

1:30 P.M. Reports on international aircraft conference.
- a—C. M. Manly
- b—D. H. Ehrman
- c—C. F. Clarkson

2:15 P.M. Symposium on tractor development.
- a—C. M. Eason
- b—D. F. Davies
- c—R. O. Hendrickson
- d—Dent Parrett
- e—Others not decided upon

3:30 P.M. Standardization in transport vehicles.
- a—Capt. Crossley, England.
- b—Capt. Vandevelde, France.

4:00 P.M.—Demonstrations and exhibits.
- a—Farm tractors
- b—Ordnance vehicles
- c—Quarter vehicles
- d—Medical corp vehicles
- e—Miscellaneous

Wednesday, June 19:

Dayton Factory visits.

The aeronautic exhibits included ten war aero-engines, the Liberty, Rolls-Royce, Renault, described on another page of this issue; the Hispano-Suiza, the Mercedes, the Benz, the nine-cylinder Le Rhone and others. There were four complete aeroplanes. The new De Haviland battleplane with its four machine guns created great interest, as did the Spad and German Rumpler. The original Wright machine, first flown in 1910, had a place of honor. The exhibits were arranged in such a way that the closest inspection could be made of the machines.

A dissembled Liberty motor was shown—every part from the smallest bushing to the crankshaft. A dissembled De Haviland was also shown.

It is not surprising that with such an atmosphere there should have been uttered by speakers at the Orville Wright dinner and at the other sessions so many expressions that deserve permanent places in automotive engineering history.

President Kettering was the vivacious leader; in fact, he was literally effervescing all the time. He wound up the meeting with a sermon on farm tractors by declaring that we are in the ex-cart stage of the automotive industries and that we must build better tractors for the farmers and stop over-selling them.

Our program of the last year in aviation came in for a tidal wave of praise. Howard E. Coffin, recent head of the Aircraft Production Board, attended most of the sessions and was the star speaker at the Orville Wright dinner. He is as firm a believer as ever in what has been accomplished in the past year and told how our training aviators are to-day averaging 220,000 miles of flying per day, which nearly equals nine trips around the world each day. In three months we will be producing in a dozen plants nearly 100 Liberty engines per day and yet in England they are only producing 50 per week of a well-known engine that we have been criticized for not manufacturing. Had we taken up the manufacture of the engine last year, when we started developing the Liberty, we would not have been in production as we are to-day.

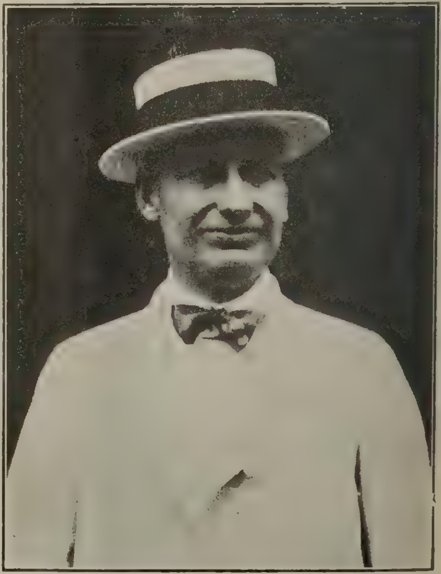
European nations gave us a year to get into aviation engine production, but we are into production in eight months. The error we have made in our aviation program was that of too great optimism last summer, when we announced that we could do more than was humanly possible.

There have been seventeen different aeroplane investigations this year, and in every case excepting some in progress at present the investigators have given up in despair because of the magnitude of our aviation program.

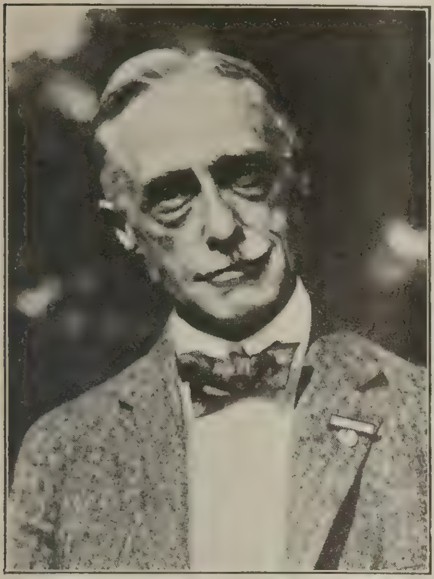
Major Jesse G. Vincent told how fast the Liberty engine is by a comparison with an engine used in a motor truck, the same engine used in a light racing car and in a touring car, and Director Stratton of the Bureau of Standards gave his explanation of its speed by asking how fast is a locomotive and answered it by saying:

"That depends on the load it has to carry. If the Liberty engine is in a single-seater fighting plane it has very high speed. If in a two-man fighter it has a slower speed. If in a day bomber it is still slower and if in a night bombing plane that must cover long distances, carry heavy loads of bombs and remain in the air for many hours, its speed may not be over 90 miles per hour."

F. G. Diffin, one of the delegates of the S. A. E. to the International Aircraft Conference in London last February, declared that as a nation we underestimate the fighting strength of



Howard E. Coffin, who brought an optimistic message to the conference.



Elmer A. Sperry, of gyroscope fame.

Germany in the air, and that she is preparing to build in tens of thousands; that at present England and France have practically reached their limit of aircraft production and we must henceforth carry the burden.

The Professional Session

In opening the first professional session of the S. A. E. meeting President Kettering laid emphasis on the fact that all the displays on the ground were not of a commercial nature, but were gathered to serve an educational purpose. There had been no intention, he said, on the part of the Society to achieve any other aim than to educate the various industries which would be of service to the Government in the conduct of the war.

The aim in securing papers for the meeting Mr. Kettering said, had been to spread information on the various lines of engineering development work foremost at the present time. In this connection a word might be said regarding the activities of the Society. It was surprising to find how many people outside of the Society knew nothing of its existence. There were some who were using the data sheets of the Society and at the same time cursing the Society itself. It should be the object of the membership to get the people of the country to know that within the Society of Automatic Engineers was contained the talent that had made possible the automobile of to-day. The Society, Mr. Kettering said, had been loved and damned almost in the same breath, which was largely caused by lack of understanding of the motives behind its work. To overcome the antagonism with which the Society had met, the management had deviated slightly from established practice in arranging the program for this meeting.

Aeronautic Division Report

The serving wire for non-flexible single-strand steel cable now recommended is 0.0204-in. soft-steel tinned wire. It has been found that 0.08180-in. wire permits the use of a thimble having the same nominal size as the cable, whereas with the 0.0204-in. wire a thimble one size larger is necessary. The 0.0180-in. size is therefore recommended.

Air Craft Screws and Bolts

Aircraft bolts are usually long, and pass through wood, so that the fine tolerances specified for automobile screws, which pass through metal, are not required. The full strength of the aircraft bolt must be maintained, and therefore the maximum limit should be the nominal diameter with a normal manufacturing tolerance. In view of this condition it is recommended that the nominal maximum diameter be maintained, with tolerances as follows:

Sizes No. 4 to 10 inclusive, plus 0.000, minus 0.003 in.

In sizes No. 12 to ½ in. inclusive, plus 0.000, minus 0.004 in.

In sizes 9/16 to ⅝ in. inclusive, plus 0.000, minus 0.005 in.

Aircraft Bolt-head and Nut Dimensions

Thorough tests have been made of many bolt-heads and nuts of various thicknesses and grades of steel. As a result it is recommended that the practice for determining bolt-head and nut dimensions be as follows:

Full-strength nuts shall have a thickness equal to three-quarters of the bolt diameter.

Full-strength bolt-heads shall have a thickness equal to one-half the bolt diameter plus 1/32 in.

Thin nuts for shear bolts shall have a thickness equal to one-half the bolt diameter for ¼ in. and larger.

Check nuts shall have a thickness equal to one-half the bolt diameter for ¼-in. and larger.

In view of this it is recommended that the practice stated above shall govern bolt and nut design, but that dimensions for all thin aircraft nuts in sizes smaller than ¼ in. shall be in accordance with S. A. E. full strength plain-nut practice.

Aircraft Bolts Thread Pitches

Pitches for bolt sizes No. 8 to ⅝ inclusive have been recommended, but exception has been taken to the 12-32 size by both the Army and Navy, it being asserted that this should be 12-28 to correspond to the A. S. M. E. pitch. At the time the recommendation was made, the majority of aircraft manufacturers were using the 12-32 pitch and in order not to interfere with production it was decided that it should be used as a war measure.

As both the Army and Navy had issued specifications calling for the 12-28 pitch, it is recommended that the 12-32 pitch be changed to 12-28 for all S. A. E. aircraft screws and bolts in order to unify American aircraft practice. It is also recommended that aircraft bolt sizes 4-48 and 6-40 be added to the list of S. A. E. aircraft screws and bolts.

Recent A. L. A. Library Service in the Navy

At the Naval Training Station at Newport, R. I., the "House that Jack Buitl" is being equipped as a regular library, by the Training Station and the American Library Association in co-operation. The work is under the direct supervision of Dr. Edwin Wiley, librarian of the Naval War College. This building will hold about 10,000 books.

At Pelham Bay Naval Training Station, Miss Blanche Galloway is in charge of the library work. Further developments in the service at this point are expected in the next month or two.

The Mare Island Navy Yard will have an A. L. A. librarian within the next few weeks.

Charles M. Manly, pioneer aeronautic engineer, chairman of the Standards Committee.

Mr. W. B. Reese, at one time Post Librarian at the Presidio, in San Francisco, will be in charge. A small library headquarters building has been authorized.

Mr. Paul M. Paine, librarian at Syracuse Public Library, is organizing the library work in the Naval, Marine and Military stations and camps in the vicinity of Charleston. He will gave general supervision also over the library work at Paris Island.

At Pensacola Naval Station, Mr. F. W. Jenkins, librarian of the Russell Sage Foundation, New York City, is in charge of the library.

Coker F. Clarkson, under whose general-managership the S. A. E. has just concluded its most successful Summer Conference

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Plants Combine to Aid in Winning War

Atlantic City.—The basis for a federation of all the industries of the nation as a forward step in winning the war was inaugurated at the War Convention on June 12. Manufacturers representing New York, Pennsylvania, New Jersey, Connecticut, Massachusetts and Delaware attended the meeting.

The federation, speakers said, would embrace 300,000 industrial plants employing upward of 10,000,000 men, with a capitalization of billions of dollars. The problems of safeguarding business interests after peace has bene declared also was under consideration.

Manufacturers representing about thirty thousand plants in the six States agreed upon the fundamental details of the Federation. The plan will be pushed throughout the country. In urging this action Austen Colgate, of Jersey City, said:

"Give us an organization of this kind, linking manufacturers of this country in one federation and there will be no problem during or after the war that we cannot solve."

A resolution was adopted by the manufacturers pledging to President Wilson their unfaltering support.

"Ace" Flies Over Lakes

Montreal.—Lieutenant Flachaire, the French "Ace," who has been assisting in French patriotic work here, left in his aeroplane for Cleveland at 11:30 A. M. on June 19. He planned to follow Lakes Ontario and Erie, and to make the trip in less than four hours.

To Sift Flying Accidents

Washington.—The Senate Sub-Committee on Aircraft is to inquire into the causes of the numerous accidents resulting in the deaths of student aviators. Chairman Thomas wrote Secretary of War Baker for the names of all men killed or injured in flying accidents, and the dates and places, together with the make of the machine, the kind of engine, and all other available data in each case.

PRESENT-DAY PROBLEMS IN AERONAUTICS*

By W. B. STOUT

Technical Advisor, Aircraft Board

IN attacking any problem for action and for real results three steps always are necessary.

First, one must know *what to do.*

Second, he must find out by research and analysis *how to do it.*

Third, by organization and executive control he must *do it.*

No one of these three divisions can be left out and still get really efficient action.

When the war started America, owing to the patent situation, had small knowledge of aircraft, aircraft designs or aircraft manufacture. The firms operating were few and of small talent. To enter the aeroplane business at that time was merely to invest in a lawsuit.

Europe having been at war for some time, had developed fighting aircraft, regardless of hindrances, and had seen, too, a certain amount of strategic possibility. In the time available there was no opportunity for us in America to learn, more than in a perfunctory manner, just what it was we had to do. The nation and some of its patriots were confronted with the problem of handling all three divisions of action at once, being actually organized and *doing* the job at the same time that they were learning *what they had to do,* and further getting their first education as to *how to do it.*

With all this in view and the confession of a colossal ignorance, not of *anybody* but of *everybody* in America so far as aircraft were concerned, it is a great credit to those who finished the first stage of aircraft production for war that they could do so tremendous a job in so short a time.

When one remembers that within one year a mushroom organization was confronted with the task of spending judiciously more money than was spent on the Panama Canal in eight years, one has a vision of what a real man's job this was.

When one adds to this the tremendous inefficiency forced upon the organization by past congressional acts, which bound every movement with red tape and suspicion, he sees the task three times as hard to accomplish as though the work could have been done under industrial methods of centralized trusted authority.

That to date in the aircraft program we have accomplished almost the impossible does not by any means prove that our problem is solved. We have spent the time to date learning what aircraft are and how they are being built in Europe. We have had little, if any, time to absorb the necessary lessons relating to production and shipping requirements which as we have them, are different from those of our Allies abroad.

With the present type of aeroplane construction—an attempt to copy foreign designs requiring foreign types of labor—we may never be the help of the Allies in the air that we wish to be. If America is to produce the cloud of ships which she has promised herself to put into the air, other means must be designed for building aircraft than those now existing.

Aircraft design can be divided into four major branches:

First, *aerodynamics* or the air theory of the plane.

Second, *structure,* which has to do with the materials and strengths of the different parts.

Third, *mechanical arrangement,* which is coupled very closely with both.

Fourth, *production design.*

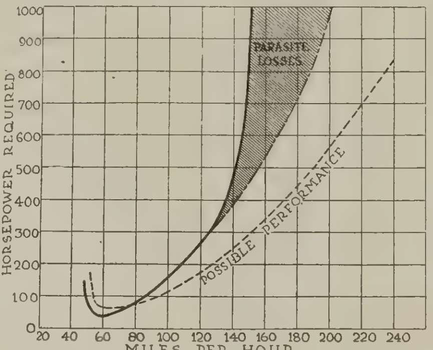


Fig. 8—The losses due to parasite parts in an airplane, the theoretically possible performance and the horsepower required for various speeds in m.p.h.

A fifth, known as *accessory design,* might be added.

Aerodynamics, in its fundamentals, is very simple. There is no final necessity for complicated mathematics in working out aeroplane problems.

If one advances a flat plane against the air, as in Fig. 1, the center of wind pressure *C* will be at the center of the plate *P.* If this same plate, however, is tipped at an angle and sent forward against the wind, the center of pressure will move forward up against the leading edge. Since to support an object one must lift it from its center of gravity, this plane at an angle will not support itself, since the center of the weight of the plane is at *CG* or the center of the plate, while the center of pressure *CP* is at the front. This will cause the rear end of the plate to fall, and instead of flying through the air, it will whirl about and fall without support.

As an illustration of this try to push a floating board under water with a stick. If we push down near one end of the board, that end will be forced into the water while the other end will still float so that the stick will slide off the end of the board. If we push to one side or in front of the center of displacement or flotation, the board will go under the water only at the point on which we push, but if we place the stick at the center of flotation of the board, we can push it entirely under the water from this one point of support.

In an aeroplane, there can be only one center of lift and one center of gravity, so that for free flight and proper balance, these must coincide. Thus, in order to make the plate support itself, either the center of gravity must be moved forward by adding weight to the front edge of the plate until the *CG* coincides with the *CP,* or tail surface area must be added at a negative angle to bring the *CP* back to the *CG.* For all flight, it will be seen that *the center of weight must coincide with the center of wind pressure of lift.* In an aeroplane, in order to obtain flight, the wing surfaces at the front must attack the wind at a certain angle, known as the angle of incidence, shown at *X* in Figs. 2 and 3. If left to themselves, the wings would not take this angle, but would merely travel through the air undirected, as does a stick or an arrow. To give them the proper angle of incidence the tail surface *T* is given a negative angle, so that when *T* travels horizontally, the lifting or wing surfaces will be tilted at the certain angle of incidence *X* to give them lift.

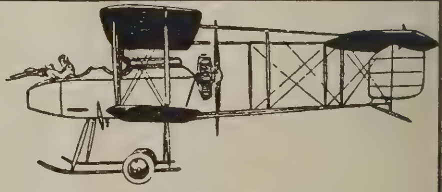
Aircraft must be designed for specific uses. If one is going to build a boat, the designer decides how fast he wants it to go, and how much load it must carry. Immediately he finds that a compromise is necessary, for if he builds a hull to give maximum lift or cargo capacity within its dimensions, he has lost speed possibilities and has produced a slow-going craft. On the other hand, if he designs for speed, there comes immediately the problem of reducing the weight of all parts, fuel and cargo, in order to get sufficient flotation within the dimensions that are required for speed. The same analogy holds in present-day aircraft, and the wing curve of a plane is a fairly decent analogy to the boat. A deeply cambered or curved wing, of fairly thick section, gives great lift at steep angles, and is ideal for weight carrying. This type of wing curve is shown above in Fig. 3. If, however, one designs for speed, he selects a wing better stream-lined and which disturbs the air less at flat angles.

Speed and Wing Pressure

Remember that at speed the pressure on the wing becomes greater per unit of surface area, and as the pressure becomes greater, the plane flies with a smaller angle of incidence.

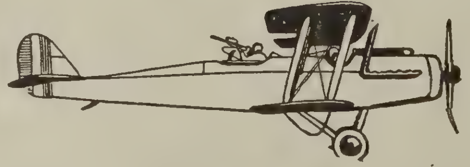
Thus, when the heavy lift wing shown in Fig. 3 gets up to speed, it takes a smaller angle and offers at once a great deal of resistance to forward travel through the air. To try to make a wing of this curve travel at speed is just as sensible, as I have said before, as to attempt to

The Gotha, 1917

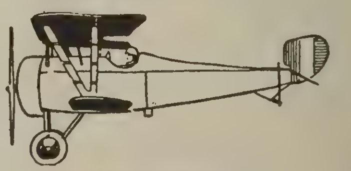


The Vickers Gun Bus

The Spad, 1917



The De Haviland 4, 1917



The Baby Nieuport, 1916

Recent Types of Planes

The Albatross III, 1917

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* Paper read before the summer meeting of the Society of Automotive Engineers.

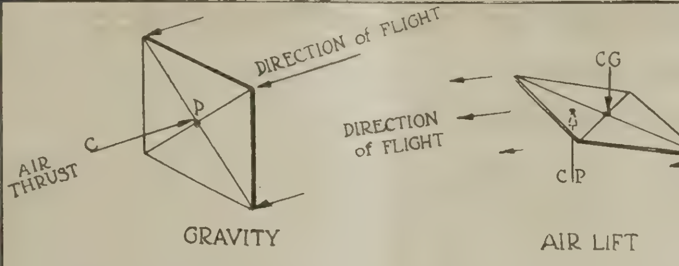

Fig. 1—Illustrating that the center of wind pressure on a plane and the center of gravity must coincide if the plane is to fly

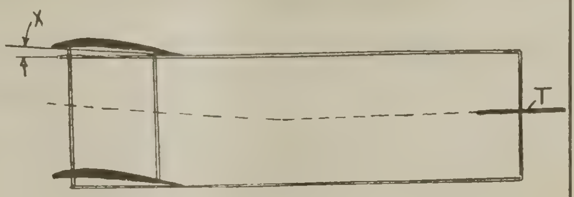

Fig. 2—Showing how the wing surfaces of a plane are tilted at the angle of incidence when the tail surface T travels horizontally

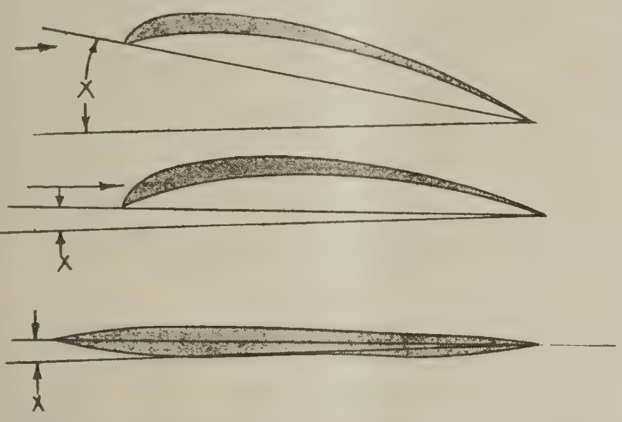

Fig. 3—A deeply cambered or curved wing, of fairly thick section, such as that shown at the top, gives great lift at steep angles and is ideal for weight carrying. The stream-lined wing of the races is shown at the bottom

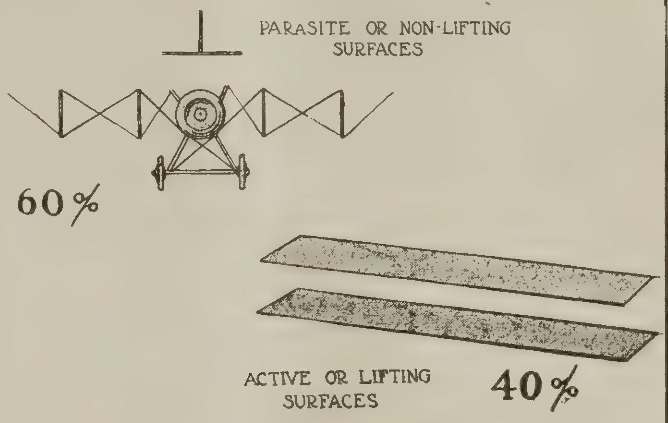

Fig. 4—Showing the so-called parasite parts of an airplane which are necessary for structural or operating reasons but which add weight and resistance without contributing to the lifting or supporting of the plane

crowd power onto a canal boat and turn it into a racing yacht. The addition of power will do nothing but pile up a bigger wave in front of the ship and will add almost nothing to its speed.

This has been proved in certain types of planes; we have replaced 400-hp. engines by engines of 200 hp., but as a result of double the thrust, the gain in speed was only 3 or 4 m.p.h. As a contrast to this, we have taken the same engine in a much heavier plane, but fitted with a speed wing curve, and have driven it at tremendous speeds.

This brings up one of the earliest ideas which was used to design planes for speed, and which was mentioned before the society last year by one of the speakers* from abroad. Although the heavy-lift type of wing cannot be driven to speed by the addition of power, yet the speed type of wing can be driven to greater lift by one of two methods, first by increasing the flying speed, which means landing speed, and second by adding greater area to make up for the loss per square foot of lift.

Racing planes, rather than having clipped wings of heavy lift, tend toward large wing areas and light loading, but with the nicely stream-lined wing curves shown in Fig 3.

In adding this wing area one must also add more wing area to lift the weight of the wing area he has just added, which is the equivalent almost of a dog chasing his tail. The additional weight per square foot in the wing is around three-quarters of a pound, yet, on account of the extra weight of this new wing surface also, one must figure a weight of 1½ lb. per sq. ft. for all the wing surface added.

Addition of weight on the wings, however, is not of much tremendous importance if one does not increase the flat-plate or parasite resistance, a point that I will explain later.

If the designer increases the weight, however, of the engine or body, known as the fuselage, he must add 3 lb. to his total for every pound of additional engine weight; either in extra wing structure, extra tank weight or fuel weight, or added truss. These figures are, of course, structural figures, but I give them to show how closely structural, all the way through, are connected with the aerodynamic considerations, and that in changing the aerodynamic features one cannot for a moment forget the structural fundamentals that he must follow.

By developing the idea of increased wing surfaces and greater penetration or speed possibility on the part of the wing curve, we have been able to build aeroplanes of such wing efficiency that the wings have now become one of the least points of resistance at high speed, for the parasite resistance is dominant.

Fig. 4 shows the so-called parasite parts of the aeroplane. These are the parts necessary for structural or operating reasons, but which offer resistance to forward travel without adding to the lift or support of the plane. They include struts, wires, landing gear, radiator, piping, exposed control wires, pulleys, body, tail surface edges, tail skid, and things which to the layman seem so trivial as to warrant no real thought. In a speed plane, however, the exposing of a water pipe from the engine to the top wing, might slow down the maximum speed of the plane 5 m.p.h. Adding stream-line wires in the place of round cables might add 10 m.p.h. to the speed of the machine.

In speed planes today, at maximum rate of travel, more than 60 per cent of the engine power and gasoline consumed is used up in forcing these parasites through the air, and only 40 per cent of the horsepower is usefully used. It is as though a speed boat going

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*Wing Com. J. T. Seddon, S. A. E., Transactions, Vol. 12, Part II.

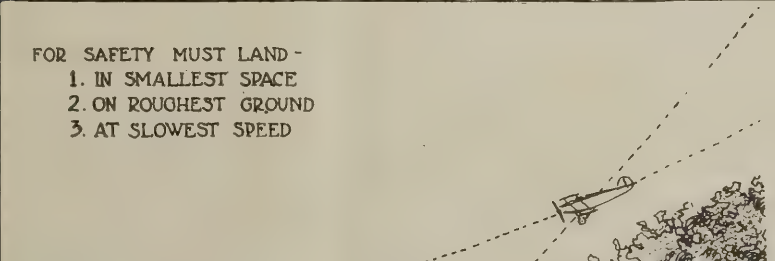

Fig. 9—A comparison of the landing of high and low speed types of planes

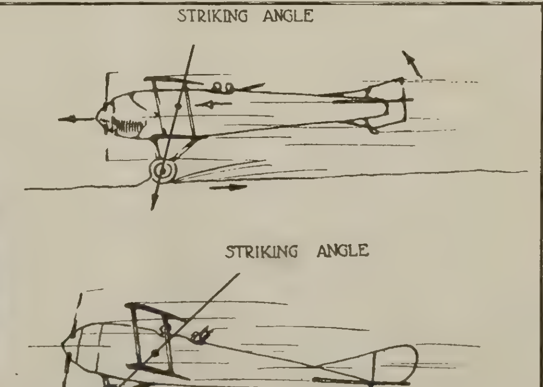

Fig. 10—Showing the difference in striking angle of planes with high and low centers of gravity

through the water, and having a beautifully stream-lined hull, should be forced to run a race with a log dragging behind, or like a car in a race with the emergency brake set the whole time, wasting power for nothing.

The greatest problem today of the aeronautical engineer, both as to aerodynamics and structure, lies in the elimination of the parasite, or as the British call it, "flat-plate" resistance.

While the aeroplane today contains essentially the same units of structure as in the beginning, yet the mechanical arrangement has varied as new engines, materials and processes and greater experience in flying have shown the way. The early two-propeller pusher with exposed pilot and no body construction gave way to the single-propeller pusher type with the pilot seated in front of the engine. In case of a spill, however, or a bad landing, the engine had a nasty habit of coming forward through the pilot before striking the ground, for which reason particularly this type of machine was gradually discarded. Another deficiency of this arrangement was that in case of propeller breaking, which happened on the small-engined machines of the early days, the pieces of the blade were likely to cut off the rear tail structure and bring the pilot to serious grief.

Then came the tractor type of plane first shown in the Nieuport monoplane with the engine and propeller in front and the pilot just back of the wings. This type of plane has passed through a high state of development in all sizes within the horsepower limitations of one engine.

With the next new mechanical arrangement first principles were used, two propellers being placed out on the wings and *pushing* the planes. The engines were directly connected to the propellers, and were fitted on the wing. This later gave way to a similar arrangement of the engines but with *tractor* propellers in front of the wings. Recently we have had planes fitted with many engines distributed over the wings, each with its separate propeller. Some of these machines weigh as much as fifteen tons.

Monoplane Construction Difficult

Outside of engine and propeller location there are three general mechanical arrangments of these tractor planes: Monoplanes, biplanes and triplanes. These types are so well known as to need no further description. The monoplane aerodynamically is the best type of design, but constructionally it is to date almost impossible. Requiring double the area in one wing for the propelling of the same spread or a deeper chord. This decreases the aspect ratio and hence the aerodynamic efficiency. To increase the span of the machine, means structural difficulty, as the spars can only be as thick as the wing section will allow and beyond a certain span this construction cannot be built with the factor of safety required in the air. Efficient monoplanes, therefore, are ordinarily flimsy and dangerous for quick evolution, having less space and heavier wing loading than the biplane on account of structural limitations. As a result, they have a considerably higher landing speed, which again makes them dangerous except for the most skilful of pilots.

A big disadvantage of monoplanes in war is the tremendous blind spot under the wings, where the pilot can see absolutely nothing. He can see everything above and out to the horizon, but nothing below him. The parasol monoplane developed with the wing above the fuselage so that the pilot can see beneath and above, gives excellent vision but compromises with center of thrust and head resistance in such manner that it is still of doubtful value.

Structurally the biplane is superior and is far less in weight per square foot, but again there is a difficulty of vision. Although the pilot can see more below, since he is farther up from the lower wing and has a narrower wing chord to hide his view, he has a second wing above him which slightly hinders his view, enabling a plane to dive on him from the front along a certain line without its being seen until it is close at hand.

Every blind spot on a machine is dangerous, especially in bombing machines or combat types, because the Hun pilot spying a machine from afar and "seeing you first" knows from the make of the machine just where the blind spot is and how he can sneak up under it or around to one side in such a position that he cannot be seen until he opens fire. In formation work one is not permitted to circle around in order to retain his vision in all directions. Over enemy territory, it is important that the pilot keep his place in the formation, traveling and reducing speed with it.

A man in a formation over enemy territory who misses his place in the line and for any reason falls behind is much like a ship, which in a convoy crossing the Atlantic has engine trouble and falls away from the protection of the battleships and destroyers. One never knows when a speed scout flyer is hiding in a cloud. The Huns follow a formation fleet cross-country as submarines follow a convoy and pounce at once upon any plane that drops behind to an unprotected position. If one flyer on the frings of the formation can by attack be forced to dive away from his fellows, he is immediately at the mercy of the Hun scouts who will not come too close for fear of receiving the combined machine gun fire of the squadron. If there is a blind spot in the machine, it is possible to force it out of formation.

To permit better vision and also in an attempt to decrease head resistance by the elimination of struts, the triplane has been used extensively. In this type the wing span can be fairly narrow, enabling the machine to land in confined places. The wings are so narrow that the pilot's view is almost complete while the tail construction is small and short, allowing greater agility for air flights and less chance of the enemy flyer hiding where he cannot be seen.

There is no decision as yet as to which is the best type, but in analyzing present-day problems one can suggest the following lines of experiment with each type of machine:

1—How can we overcome the visional and structural disadvantages of the monoplane in order to acquire the aerodynamic advantage which we must admit the bird type of plane possesses?

2—How can we develop the biplane for less parasite resistance and greater vision, although this type is to-day in a higher state of development than any other?

3—How can we obtain greater aerodynamic ability of the triplane to fit the decided structural advantages which it possesses?

We may thus run the gamut of experimentation from aeronautics to structure and back again in these three types of planes alone. And there are others unthought of.

Following this discussion of present possibilities and requirements in aeroplanes for war and of the next steps to fit what we know to the requirements of to-day, it is worth while to look ahead to see what the future offers in the eventual development of aircraft. In the development of the automobile not one-hundredth of the money per month was spent in perfecting models and ideas that is now being spent on aeroplanes. New automobile models were brought out annually and were in the experimental stage for months.

New aeroplane models must also go through these months of experimental work, but on an average new models and types are taking precedence on the battle front every eleven weeks.

The automobile industry has developed materials and processes, parts and types of organizations through years of effort. In developing aircraft we have all of these related industries and organizations to draw on for knowledge and material. We are thus able to move in development work *five times as fast* as was possible with the automobile, a fact which is worth more than passing thought. This means that the man entering the aircraft industry today *must think five times as fast* as the automobile executive, in order to keep up with the industry, and that an engineer must have five times as much vision and mobility of mind in order that he may keep his place in progress.

A very fine line must be drawn between conservation, as we have known it in other industries, and what we call conservatism in the aircraft industry. What would be reckless judgment in established industries might well be ultra-conservative judgment as related to aircraft design. It is largely for this reason that during the war period the business man of the old type has been so quickly eliminated from this new industry in favor of that type of man who thinks quickly and fast, and is willing to take long risks, trusting to his own judgment. This type of action necessitates great mistakes as well as great successes.

The British Air Board, for example, was changed five times in the first year of its existence, largely, we are told, because the industry grew faster than the vision of the men then in the Air Board could follow. This work is now entirely in the hands of one man, and a man of quick acting vision and definite commercial experience. That our own program is taking similar form, so far as organization goes, is one of the most encouraging items of to-day.

This type of vision naturally requires that research follow every available idea, and research is but a way of "wasting money intelligently." Tremendous sums can well be spent during the next few years in developing aircraft for war, remembering that a day of war saved means a gain of fifty millions of dollars and six thousand lives.

With these ideas in mind it would be well to conclude this analysis with visions as fanciful as we can summon to mind, which still are based on sound engineering judgment. From this viewpoint I predict that operating speeds will exceed 5 miles a minute in aeroplanes before we can call aircraft really developed machines.

I have discussed the parasite or flat-plate resistance as being a fundamental defect of aircraft. Fig. 4 shows the parts that at high speeds now form the greater part of such a loss.

The solid area in the curve, Fig. 8, shows approximately maximum performance to date. The ordinates indicate the horsepower required; the abscissas designate the miles-per-hour of speed. It is evident from this that above a certain point additional horsepower does not give an equivalent addition in speed, so that even should we double the horsepower of engines of the same weight we would not materially increase the flying speed of a plane as built to-day, although we could reduce its landing speed.

It is possible to operate wing sections efficiently at a speed of *8 miles per minute,* as is proved by propeller tips on machines flying at present. These tips in our Liberty planes travel 8 miles per minute, and their efficiency is nearly 85 per cent. There is no reason, from a pure engineering standpoint, why curves in the form of wings cannot perform equally well. The fundamental difficulty is in landing, for although it should be possible to build a machine today to fly at almost any speed we want, yet the landing problem is so great as to make real speed prohobitive.

If we learn from the German long distance gun, which sends its shell up from the earth to a point where the atmospheric resistance is negligible, we may also send airplanes to equivalent altitudes, with special engines developed for that work, and thus in a much lighter medium, with less resistance, obtain our speed range. This will require the solving of many problems. It will mean new propelling apparatus, or propellers. It may even mean special fuels to be used at altitude.

There are various ways of attempting the problem and as we are gaining experience through actual work at 20,000 ft. and over, it is possible and even, in my opinion, probable, that long distance travel in the future will take place at altitudes more than 5 miles above the earth's surface. It is as though a ship on the ocean could pick out for itself water of varying density, so that for speed work it would take a medium of less resistance; or to use another analogy—it is like the sea plane, which when its operator really wants to travel fast, rises from the water and ascends into a lighter medium, even though this lighter medium requires greater supporting area. In altitude work, however, this necessity for greater area will be compensated for by the greater speed, which is the fundamental desire.

Landing a Real Problem

And so we come to the problem of landing. As soon as we have a plane that we can force to travel at high speed (see the dotted possibility line of Fig. 4), landing will become a dominant problem. We ordinarily visualize safety in landing as depending on speed alone, but speed is only one of the elements of safety. That real safety may be had *three* things are necessary.

1—To land within the smallest possible area.

2—To land on the roughest posible ground.

3—To touch the ground at the slowest possible sped.

Eventually airplanes will land almost in their own tracks, much as a pigeon lands on a window sill or a sparrow on a wire.

It is by no means proved that our present method of landing airplanes is the final one and intensive study should be put on the development of new landing systems and schemes, that greater things may be accomplished.

In analyzing landing and any one factor concerned with it, the other fundamentals should be kept in mind. Modern speed planes, for example, landing at 50 m.p.h., need a large field in which to alight, on account of the angle at which they come down and the distance they roll after striking the ground. The airplanes used in the early exhibition work flew from and landed in ball parks and four-acre lots in comparative safety. Present-day machines cannot do this on account of the necessity for speed.

Here is a thing that we know can be done, and efforts should be made to increase the landing capabilities and safety of existing planes. All three landing fundamentals require separate study.

Speed in landing is largely a question of wings and their loading per square foot. A plane with a heavily loaded wing lands at a higher speed than one with a lightly loaded wing. A plane that leaves the ground at low speed is generally hindered in its high-speed; it is to fast to fly only when it lands at a speed too great for safety. Flying at a high sped, once in the air, is not a problem but an advantage.

If landing speed can safely be increased, then the maximum speed of the plane can be increased in proportion.

Planes with small surfaces in proportion to their weight glide at a steep angle and come down fast. After they have touched the ground, however, their air resistance causes them to stop quickly.

Slow Speed Landing

Planes with light wing loading "float" easily, coming down at a flat angle to their landing place. Although they touch the ground at comparatively slow speed, they roll a long distance before coming to a stop, and must travel a considerable distance before they first touch the ground.

I was interested in seeing a landing made not long ago by a pilot, who, unused to a machine of light wing-loading, had a plane of the "floating" type out for the first time. He made a beautiful landing in the center of the field, at a higher speed than the plane was designed to land at, although at the landing speed he had been accustomed to in other planes. Once on the field, however, he had acquired so much momentum that the plane went on across the field until it struck the fence on the far side.

Fig. 9 compares the landings of the slow-speed and high-speed types of planes, it being seen that the high speed plane, although it strikes the ground faster and at a steeper angle, comes to a stop more quickly and can land in a smaller space.

A machine of light wing-loading, coming into the field over the trees as shown, must float a long distance at a flat angle before it strikes the ground. If the pilot noses the machine down sharply over the trees, by the time he has lost sufficient altitude to flatten out, he finds himself making a high-speed landing, so that the fact that his machine can land at slow speed has done him no good. After he strikes the ground, as just explained, he rolls a tremendous distance, and is in great danger of breaking the machine, although with small danger to himself on account of the comparatively slow speed.

The problem then is not entirely one of landing speed. No matter what speed the plane lands at, within reason, if the wheels strike no obstruction the landing is a safe one. If, however, at high speed they strike a hole, or a ditch, or a rut, there is a tendency for the machine to nose over, or even turn a somersault, to the great danger of its occupant. This danger is, of course, less at a lower speed. In other words, in an emergency landing with a high-speed landing machine, there is really less danger of running into objects bordering the field. There is danger, however, of nosing over, if the field is bumpy.

With a machine landing at high speed one can see that having the weight close to the ground would be a considerable advantage, a point that has been discussed somewhat in connection with mechanical arrangements. This indicates a requirement in engine design that has been lost sight of during the early development period when engineers have been learning the fundamentals of aircraft design. This requirement is that the center of thrust due to the engine should be high, or stating it in another way, that the center of weight of the engine should be low, and coincide as nearly as possible with the center of thrust of the propeller, which is, of course, at the engine shaft.

If the center of gravity on an airplane be low, then the striking angle from the point of contact of the wheels to the center of gravity of the plane, Fig. 8, will be considerable. If this angle is small there is less danger of nosing over. If it is nearly 90 deg. then there will be a great danger of a somersault, hindered only by the area of the tail surfaces. A requirement for safe landing, therefore, is a low center of gravity, and large area and leverage of tail surface.

With the floating type of slow landing machines there is just as much risk of accident with the machine but less danger to the occupant on account of the slower speed.

Future Problems

There is real opportunity for study and research to devise such mechanical arrangements—different from those now in use—as will enable higher speed landings to be made, and with quick stops.

This might be accomplished with a brake on the floating type of machine. An air brake will not do, as at the slower speeds it would have to present, presumably, to great an area to be effective. A ground brake will not entirely do, because at the time the machine first touches the ground the pressure on the wheels and skid is so small as to be almost ineffective. To apply brakes to the front wheels would be like striking a bump, and would probably mean a spill.

I am not stating how this problem of landing is to be solved. I am merely mentioning it as one of the present-day problems of aeronautics that we can well consider as of first importance.

In studying landing remember that if we can add 10 m.p.h. to our landing speed, we can add 20 miles or more to our flying speed. The ideal machine, of course, will be one of sufficient area to make a successful "pancake" landing, but machines with wing loading light enough to accomplish this feat are, with our present knowledge of structure, not within reason.

AEROPLANES OF TODAY*

By FAY LEONE FAUROTE

NO subject, if we are to believe the press today, is of more interest to the world at large, and the United States in particular, than that of aviation. This is naturally so because of its supposed vital bearing on the outcome of the war, and because it bids fair to usher in a new and yet unexplored commercial area afterward.

When the Wright brothers, on Dec. 17, 1903—only fifteen years ago—startled the world by their short but successful flight in a heavier-than-air machine, the most prophetic of us little knew the development that the next fifteen years would bring. The war came, and with it an accelerated progress, such as an industry has never known before, a mechanical activity of the most exciting sort, a marvelous awakening of invention, a speeding up of manufacture almost unbelievable; for despite what our critics say, huge steps have been taken, and still larger ones are in process today. The art of aviation has thrown off its swaddling clothes.

From the frail framework of the Wrights', with its little 16-h.p. engine, to the giant Handley-Page, Caproni and Curtiss flying-boats is a far cry. Only a Jules Verne could have imagined or foreseen such an astounding development. War is a hard master, a driver of men and minds, a quickener of invention superlative. To what an extent it has hastened aeronautical development can best be realized by a survey of the hundred years preceding this century.

Early History

Literature shows us that as far back as the Prophet Isaiah men were thinking about a way to navigate the air. About the year 1500 Leonardo da Vinci and Jean-Baptiste Dante, contemporaries of Columbus, are said to have given serious consideration to the problem of flight, and Dante is credited with having made a successful glide over a lake on a pair of bird wings which he had made after designs of his own.

Men of all ages have looked up into the air and wondered how and when they would be able to navigate it. But until fifteen years ago they did not know how. Limitations in their conceptions of time and space prevented them from solving the problem. But now, both time and space, with their attendant dimensional attributes, which are but mortal concepts, are slowly being eliminated as man wakes up mentally. Inventive genius is gradually cutting down the one and decreasing the relative effect of the other. As has been the case with all other forms of progress, however, the world is loath to accept the new. The practicable plan of a real inventor is looked upon as a fanciful distortion of a disordered mind, and the earthly limits within which the public mind has been content to move give way only under the forced pressure of demonstrated design and practical operation.

It is a curious but natural coincidence that aeronautical development has in all ages followed, or has been accompanied by wars, or other great mental awakenings. For instance, da Vinci and Dante lived at the time when Columbus discovered the new world. Sir George Cayley, in 1809, made a large glider and with it formulated many laws of equilibrium and control. He was at work during the war of 1812. Henson, Stringfeller, Wenham and Bulton—a quartette of experimenters who also made many valuable contributions to the art of aeronautics—were active just previous to and during the War of the Rebellion. Later, M. Ader in France, Sir Hiram Maxim in England, and our own Prof. Samuel P. Langley—then at the head of the Smithsonian Institution—were conducting scientific investigations, and making valuable experiments on machines during the Spanish-American War. This activity culminated in the successful flight made by the Wright brothers in 1903.

From that time until the beginning of the

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*Paper read before the Summer meeting of the Society of Automotive Engineers.

Side view of an A. V. Roe twin-motored bomber. Courtesy A. V. Roe Co. and British Censor

Great War some progress was of course made, but it is probable that had not the demand been greatly stimulated by the necessity of the Allies and Central Powers, we should still have only small planes of limited power, carrying capacity and radius.

The strategic value of an aeroplane, however, quickly brought aerial development to the fore and artificially stimulated experimentation, development and manufacture, first in Europe and then in the United States. The discovery that Germany had for years been planning the building of giant Zeppelins, making aerial maps, designing and building aeroplanes and every aerial device connected with their use, shocked the rest of the world into the realization that if it were to compete successfully with Germany it would be necessary to build machines of large carrying capacity, of a speedy character and wide cruising radius. The internal combustion engine, brought to a comparatively high state of development by its use in the automobile, rendered this possible.

To really appreciate the problems which five years ago engineers were called upon to solve, it might be interesting to take a look for a moment at the situation ten years ago—say in 1908—when most of the American flying machines were in a "featherless state," so to speak; when aside from a few exhibition flights, little of commercial value has been done. The Wright brothers, Glenn H. Curtiss, Chanute, Dr. Alexander Graham Bell, Capt. Thomas Scott Baldwin, Lieut. Selfridge, J. A. D. McCurdy, Charles Manly, and a few other pioneers, were all busily engaged proving the truth of their theories. The Wright brothers had met with some commercial success, and at military trials had demonstrated the worth of the aeroplane as a fourth arm of the service, thereby gaining Government recognition. Curtiss and Baldwin had made dirigibles and aeroplanes and flying boats of various shapes and sizes. The Aerial Experimental Association had built three biplanes, the last one of which, the "June Bug"—at an official trial arranged under the auspices of the Aero Club of America, made the first publicly advertised flight, in July, 1908. The machine successfully flew 2000 yards over an S-shaped course at a speed of 39 miles an hour.

Later, Curtiss made his famous flight down the Hudson from Albany to New York in one of his biplanes. As most of us no doubt know, there are few landing places between Albany and New York City. One was found near Poughkeepsie which Curtiss used on his way down. Fearing that perhaps he might not be able to choose a landing place, and being unwilling to have his machine smashed on the rocks, he had sometime before conceived the brilliant idea of putting on, in addition to his wheel-landing gear, twin pontoon-floats, so that if worst came to worst he could land on the surface of the Hudson River. He said he always had a feeling that water might be safer to land on than the earth, and that at least he could land on the water without a bad smash-up if he had to.

This machine, which he called "Triad," is therefore interesting as a forerunner of the hydroaeroplane and flying boat, both of which developments he later carried out to a successful conclusion. On Lake Keuka on the smooth waters of the Spanish Bight just inside San Diego Harbor, he developed the flying-boat and hydroaeroplane. It was here that he also came in contact with Army and Navy. Foreseeing the value of the aeroplane for army and navy work, he invited officers to be sent to his camp for training, and so during the winter trained many of the army and navy fliers who today are directing the destinies of our aerial forces. It was here also that he flew from land out to a battleship, landing alongside in the water, was hoisted aboard, dropped overboard again, and flew back to land. A year before Eugene Ely had succeeded in flying from land, in a land machine and alighting on the deck of a battleship. It was at this time that both the Wright brothers and Curtiss demonstrated the possibility of aerial bomb dropping, and predicted the remarkable part that aeroplanes would play in any future conflict in which the world might become involved.

On all these early machines, the pilots sat in an exposed position. Little attention was paid to resistance and streamlining, and because of the fact that most of the machines were pushers, it was necessary to put the radiator well up to the front and between the wings and put the pilot and his passenger forward. Control systems were more or less fragile and unmechanical pieces of apparatus, designed to suit the purposes of the individual pilot. No attempt, of course, had been made to standardize them nor to work out similar movements for controlling the various surfaces.

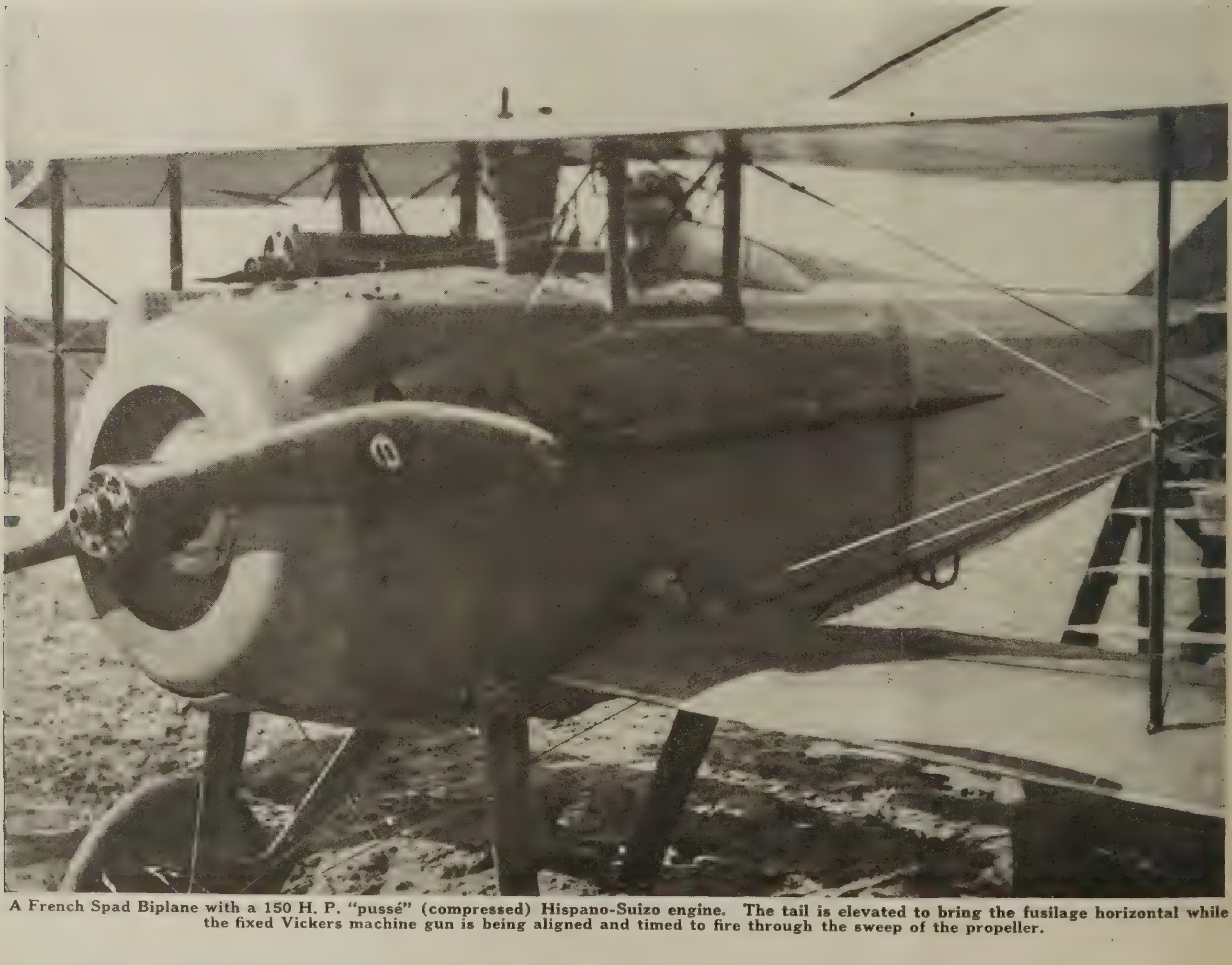
Early Design

Landing gears differed materially as did the methods of geting off. The Wrights used a form of pylon and counter-weight for launching their machine from skids.

The body or fuselage was not inclosed, the struts were not stream-line, neither was the landing-gear. The rudders were crude affairs, and the wing-panels, judged by the standards of today, were flimsy things of cloth and sticks.

All praise to those brave men who risked their lives for the development of aviation! To the Wright brothers who—in spite of all odds, laughed at by friend and foe alike, at last had their efforts crowned with success, and from comparative obscurity placed their name, and that of Dayton, upon the lips of the world—I wish to pay tribute. To me there is always in the character of every pioneer a certain something which inspires a feeling of awe; a certain far-away look, a prophetic cast of the eye almost childlike in its expression, that removes him from the crowd and causes him to be marked among men.

It were as if God Himself looked out upon the world through the eyes of His chosen few—inventive geniuses, reformers, great minds, they are; where do their ideas come from, where indeed, if not from Divine Intelligence? Surely no human hand nor mind has trained their cunning; given them their starting point, perhaps; but what of their prophesies, their enlarged views—these alone must come from Above. They are the ambassadors of Spirit, so to speak, the human mouthpieces of Divine Mind, the wideners of the vision of life itself. As such they can no longer be considered as individuals, beholden only to themselves, they are the property of the world, the hostages of society, the almoners of inventive gifts for which the world can never adequately repay them. Modest to a degree, the true genius seldom realizes his mission, nor claims his own until the world, awake at last, honors, alas! sometimes, too late to be of any real benefit to him. History alone develops the true greatness of his discoveries and grants to his memory the fitting crown of unselfish success.



A French Spad Biplane with a 150 H. P. "pussé" (compressed) Hispano-Suizo engine. The tail is elevated to bring the fusilage horizontal while the fixed Vickers machine gun is being aligned and timed to fire through the sweep of the propeller.

A German Rumpler type machine captured by the French. (French Official Photo)

Interesting Facts

And now just a few words about the theory of flight. Many models and forms of aeroplanes have been studied, many experiments performed. The theory of flight is fairly well known, so that definite results can be predicted from certain known conditions. Scientists and mathematicians have interested themselves in this branch of the engineering art, and M. Eiffel, Lanchester, Zahm, O'Gorman, Hunsaker and others, have made many valuable contributions of facts upon which aeronautical design now rests securely. This scientific research has revealed many seemingly strange things.

Few people, for instance, know that about 66 per cent. of the lifting force of the air is due to the suction on the upper surface of the wing panel, while only about 33 per cent. can be credited to an actual pressure of the air on the under sueface. It is also a significant fact that the amount of force required to move a small wire through the air is as great as that required to move a streamline strut several times its diameter. The influence of the streamline was formerly little understood and seldom taken account of in the design of struts, body and landing gear. Scientific experimentation, however, revealed the necessity of cutting down head resistance, thus decreasing what is known as the "drag" or "drift." It indicated the necessity of changing the surfaces, the cross-section of the wing panels, the sections of the struts and other exposed surfaces, to forms which would offer less resistance.

Effect of Streamlining

It is easy enough to push a thing into the air but it is hard to get it out without creating a disturbance. If we take a broomhandle, for instance, and sweep it through the air rapidly we find, if we could examine the air immediately following it, that a small vacuum is created just back of the stick itself, and that eddying occurs right behind it, creating a V-shaped partial vacuum which decidedly increases the total power required to move the stick through the atmosphere. It was early found by experimenters that by filling up this vacuum, and changing slightly the entering surface, that the stick could be passed through the air much more easily; a considerably smaller amount of power would be required to move it.

Now, when we design an aeroplane we know before it goes up into the air almost exactly what it will do. We know, for instance, that a certain type of wing-form has certain characteristics: one is good for weight carrying, another for speed, still another seems to combine successfully several desirable characteristics. Investigators have also discovered that there is what is known as an "end-wash" on a wing panel and that this can be eliminated by cutting off the corner of the panel.

Angle-Ended Planes

Most American and Allied machines use that type of panel in which the end edges form an angle, the apex of which points to the front of the machine, but Bleriot has used a type of panel in which the angle formed by the end edges points to the rear of the machine. Both types of panels have shown good performance. This latter type of end section is known as the Bleriot end. The angle at which the wing panel meets the air is another subject of wide interest. The angle of incidence, for instance, which is the angle between the direction of flight and a tangent drawn through the lower surface of the wing panel, may be varied with interesting results.

Of course, the whole object of all this work is to decrease the "drift" or "drag" and increase the "lift"—in other words, to secure a large "lift/drift," or efficiency ratio. Drift is always concomitant with lift. Drift is a measure of the waste energy that is spent in order to accomplish work. We cannot get lift without drift. Lift is a measure of the effective work, and drift is a corresponding measure of the amount of work which is absorbed or lost at the expense of which we get the lift.

Other observations are: A biplane is about 82 per cent as efficient as a monoplane of the same total surface if there is no stagger in the biplane arrangement. A triplane is about 60 per cent as efficient for the same wing area. A monoplane has 1.22 as much lift as a biplane and 1⅔ as much lift as a triplane. A biplane has 1.36 as much lift as a triplane. All of these ratios are on the basis of equal areas. The effect of stagger is to increase the efficiency of a biplane from 82 to 87 per cent, depending upon the stagger. For general purposes an aspect ratio of six is used. Fast racing machines usually have an aspect ratio of about six. For slower, weight-carrying machines, an aspect ratio of about seven or eight is used. The aspect ratio of the JN-4D is 7.3.

Modern aeroplanes may be divided into the following general types:

(1) *Combat Machines.* These are small, very fast, single-seater fighters, used for scouting purposes. They usually have wing spread of from 20 to 25 ft., a speed of 125 to 135 m.p.h., carrying capacity of 450 lbs., and a climbing speed of 10,000 ft. in from 8 to 12 min. The Spad, Nieuport, Morane, Curtiss-triplane, SE-5, Sopwith, Dolphin and Iserman Albatross single-seater are examples of this type.

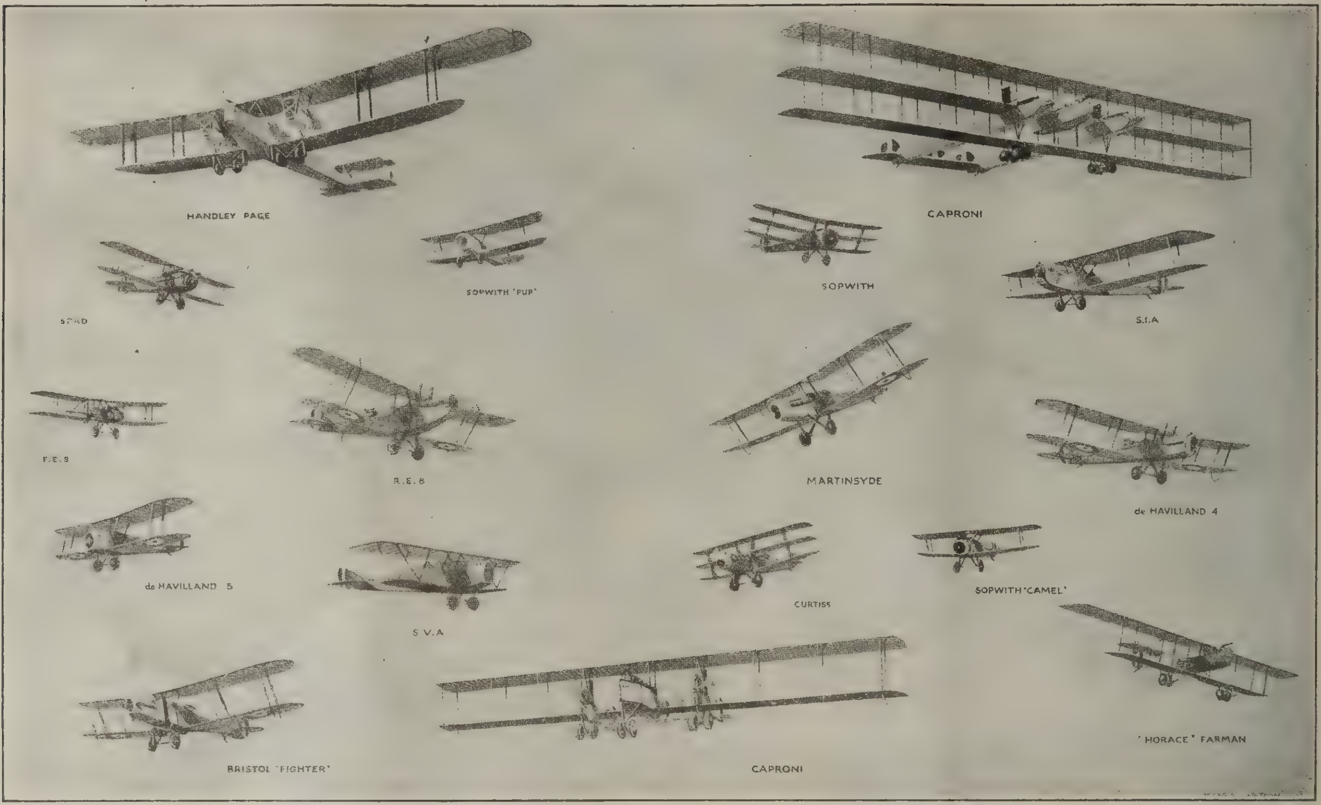
(2) *Reconnaissance and Photograph Machines.* These are a slower flying machine intended for reconnaissance and photographic work. They are used for artillery spotting, map making and general reconnoitering. The wing spread is usually from 40 to 60 ft., and the speed from 80 to 100 m.p.h., the carrying capacity from 800 to 900 lb., the machines being two or three seaters, and having a climbing speed of 10,000 ft. in 12 to 25 min. Examples of this class are: De Haviland, Bristol, Curtiss, Voisin and Farman.

(3) *Battleplane.* The battleplane is a two or three-passenger machine driven usually by one large or two fairly good-sized engines, and equipped with a number of machine guns and sometimes with a cannon. It is a moderately fast machine, making from 70 to 85 m.p.h. The Voisin is a good example of this type. It is credited with carrying a one-pounder.

(4) *Bombers.* These are of the same general type as the reconnaissance machines but slightly larger. They vary in size from 45 to 90 ft. in wing spread, and carry from two to twelve people in addition to their war load of bombs and fuel. Their speed is from 75 to 100 m.p.h., their radius of operation from 500 to 1,000 miles, and their climbing speed 7,000 ft. in 30 min. Examples of large bombers are: Handley-Page, Caproni, Breguet, the Caudron (a twin-engined French machine), the German Gotha, the Friederichshafen, the German AEG, and the big Curtiss boats. Machines that have been used for day-bombing and other purposes, but have lost their ‘pep” in remodeling, are many times used for night-bombing.

For naval work, flying-boats and hydroaeroplanes of various sizes are used. On account of the weight of their hull or pontoons these mechines compare favorably with reconnaissance machines traveling at as high speeds as 90 to 100 m.p.h. Used for coast patrol work and for naval observation purposes, they operate from stations on the coast, battleships or motherships that accompany the fleet. Hydroaeroplanes are similar in construction to land machines, except that in place of the landing-gear, single or double pontoons are fitted below the wings so that the machine may rise from or alight on the water. Most hydroaeroplanes are lighter than flying-boats. For that reason, where a craft is desired for inland water work or for short scouting trips, the hydroaeroplane is considered by many to be a very desirable type. Unlike the land machine, it is not necessary to fly high in order to pick out a suitable landing place; one can land on the water almost anywhere. For larger sea voyages, however, especially when it is necessary for the craft to remain for some time away from its base of supply, a more seaworthy type of

A German Rumpler type biplane



Representative Allied aeroplanes of 1917. From "The Aeroplane" (London)

hull is necessary. The large 92-ft. wing-spread flying-boats, which the Curtiss Company has built in large numbers, are good examples of this type. These boats have a wing-spread of about 90 ft., are about 46 ft. long, and have a hull shaped very much like a sulphur-bottomed whale. The hull is 42 ft. long, the inside is electric-lighted, completely equipped, and so arranged that one can move about comfortably. A boat of this size will carry a little more than 2,000 lb. I have been told by English officers that this boat has given a good account of itself, and that a large number of pilots have been decorated for their splendid work in attacking and downing Zeppelins in the Channel.

Conclusion

American manufacturers are not standing idle as some people seem to think. There have, of course, been many discouraging delays—many of which might have been prevented, many of which could not. I believe, however, that we are now fairly well on our way to good and continuous production.

Americans are known as great manufacturers and great inventors. American inventive genius always has and I believe always will continue to lead the world. Out of the brain of the Americans came the aeroplanes of yesterday and

(*Continued on page* 781)

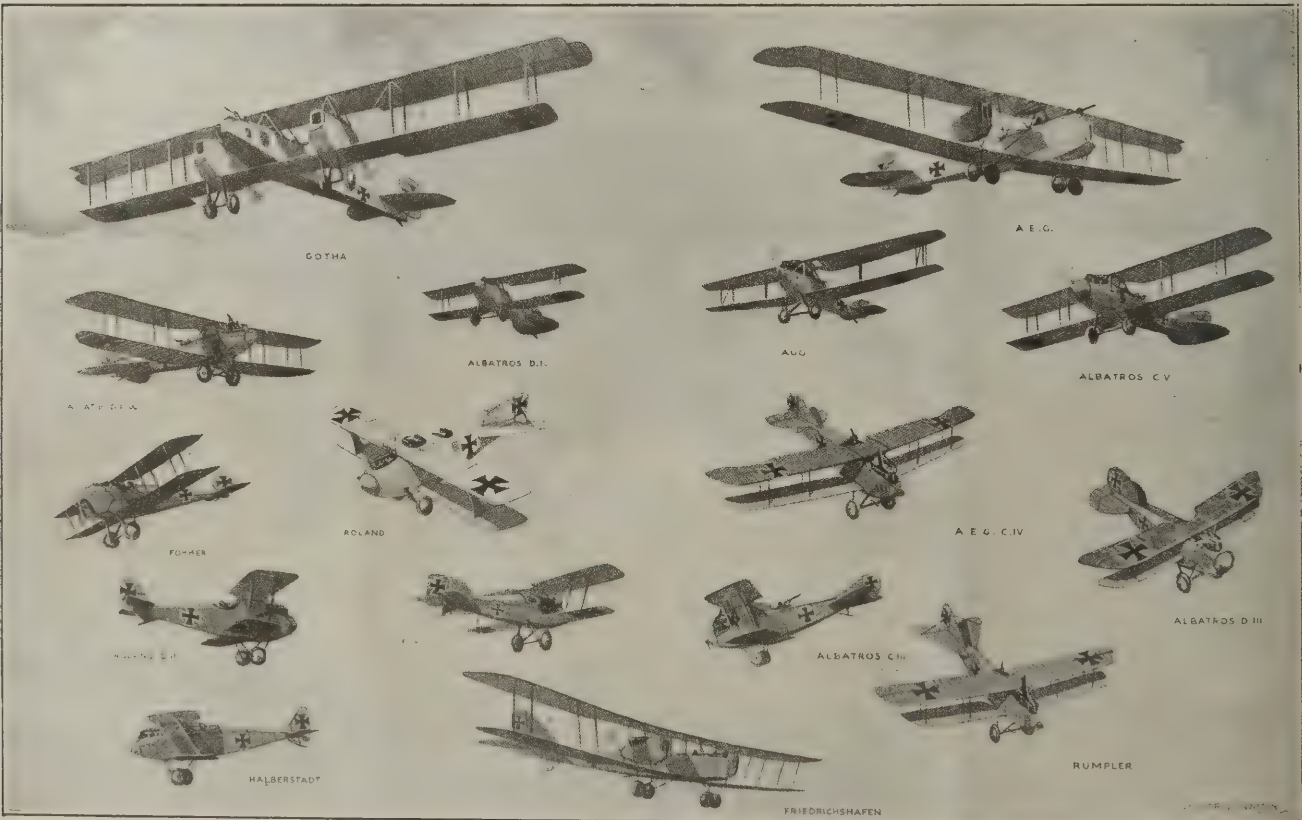


Diagram of the German aeroplanes that have been used during 1917

© The Aeroplane (London)

THE RENAULT 400-H. P. AIRCRAFT ENGINE

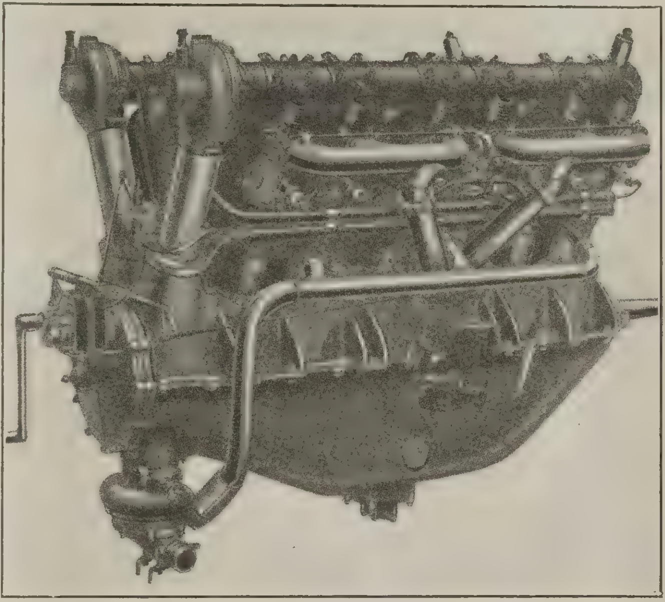
ONE of the largest aircraft engine plants in France and in the whole world is that of Louis Renault at Billancourt, near Paris. Aviation development attracted Louis Renault from the very beginning, and in 1909 he turned out his first aircraft engine, an air-cooled model of 70 h.p. This was followed by an 80 h.p. model later the same year. In 1912 Renault turned out his first water-cooled aircraft engine of 150 h.p. The following year saw his first 12-cylinder engine of 200 h.p. In 1914 this engine was redesigned and the output increased to 270 h.p. In 1915 a representative of the U. S. Signal Corps was sent to France and brought back with him the first Renault aviation engine ever seen in this country. The next year the Renault engineers developed a 300 h.p. engine, and in 1917 a 400 h.p. model was brought out which is now in production. This latter, by the way, weighs less than 2 pounds per horsepower.

To date Renault has delivered over 15,000 aviation engines to the French, British and Allied governments.

Complete aeroplanes of the Breguet type are also being manufactured under license in the Renault plant. These, of course, are fitted with Renault engines, and the whole machines are being built complete in the Billiancourt works. The planes for General Pershing are being made under the supervision of Pershing's men who are in the plant all the time.

Considerable pride is being taken by the Renault firm in the fact that it was the first to bring out an acute angle Vee engine for aircraft. As is well known, the conventional 12-cylinder engine has its cylinder blocks set at an angle of 60 degrees, this being the angle insuring uniformly spaced explosions. The Renault engine has its cylinders set at an angle of 47½ degrees. A closely similar practice is followed in the Liberty aircraft engine, which employs a 45 degree Vee. The object in making the angle of Vee so small is to reduce the head resistance.

Renault engines are used for various classes of aircraft, including training planes, bombing planes and combat planes. These engines are of the sturdier class and are not used in the scouts and similar types of machines which require engines of the very highest weight efficiency without so much regard to reliability or durability. As an indication of the growing endurance of aircraft engines it is interesting to note that the service period of Renault aviation engines before they are subjected to an overhauling has been increased from 120 to 200 hr., and this is believed to be the longest consecutive service period of any aircraft engine.



The 300 H. P. twelve-cylinder Renault engine.

We are indebted to *Automotive Industries* for the following facts concerning the Renault 12-cylinder motor. The cylinders have a bore of 125 mm. and a stroke of 160 mm. (4.92 x 6.30 in.).

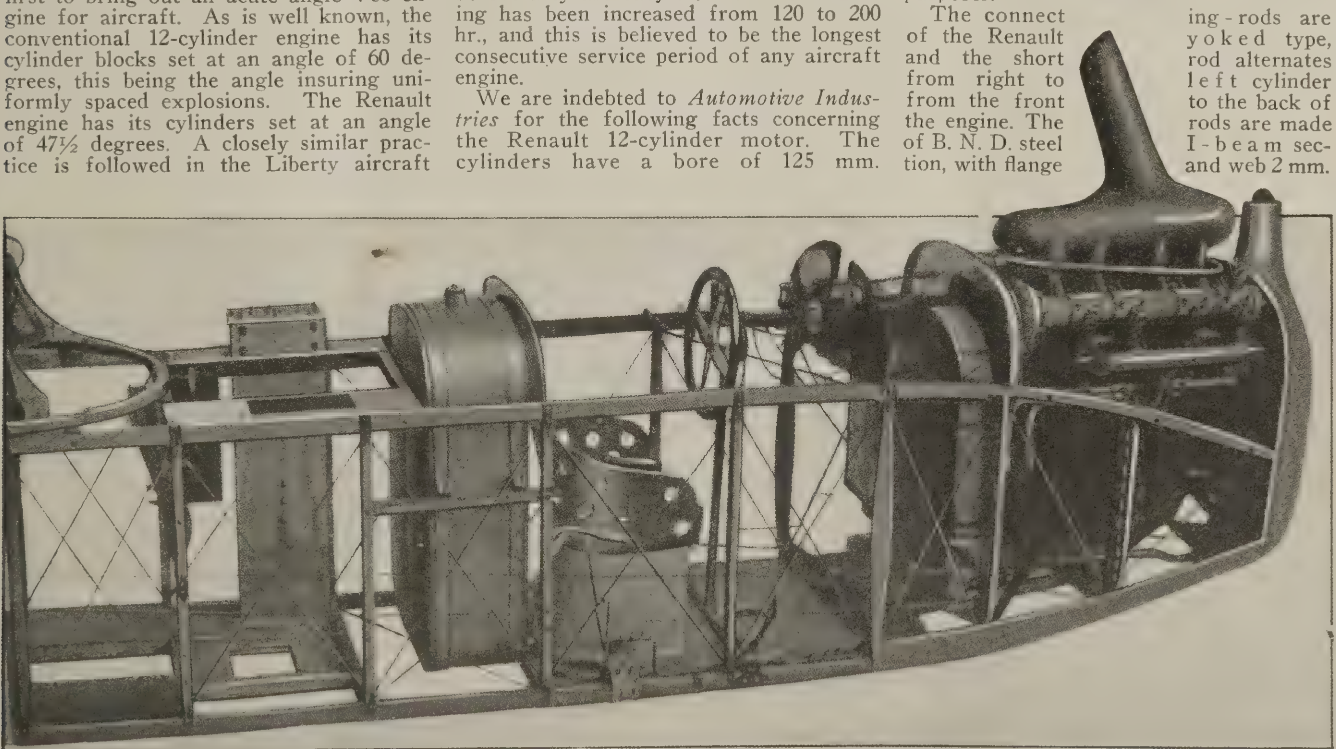
The cylinder water-jacket completely surrounds the exhaust valve guide. There are two valves for each cylinder of 66 mm. (2⅝ in.) diameter. The valve port is 61 mm. (2 13/32 in.) and the inlet to the elbow 53 mm. (1 3/32 in.) in diameter. The valve stems are both 11 mm. (7/16 in.) diameter, with a head approximately 5/32 in. thick and a 45 degree seat ⅛ in. wide.

The end of the valve stem is threaded to carry the spring cup and lock nut. Each cylinder barrel and head is machined from a forged bar, after which the intake and exhaust elbows are welded on, and finally the pair of cylinders is incased in a jacket which is welded from three pieces of steel about 1/32 in. thick. The cylinder walls themselves are 3 mm. (7/64 in.) thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profile-milled out of steel. The flanges are screwed on the cylinders and welded and brazed on the intake and exhaust pipe.

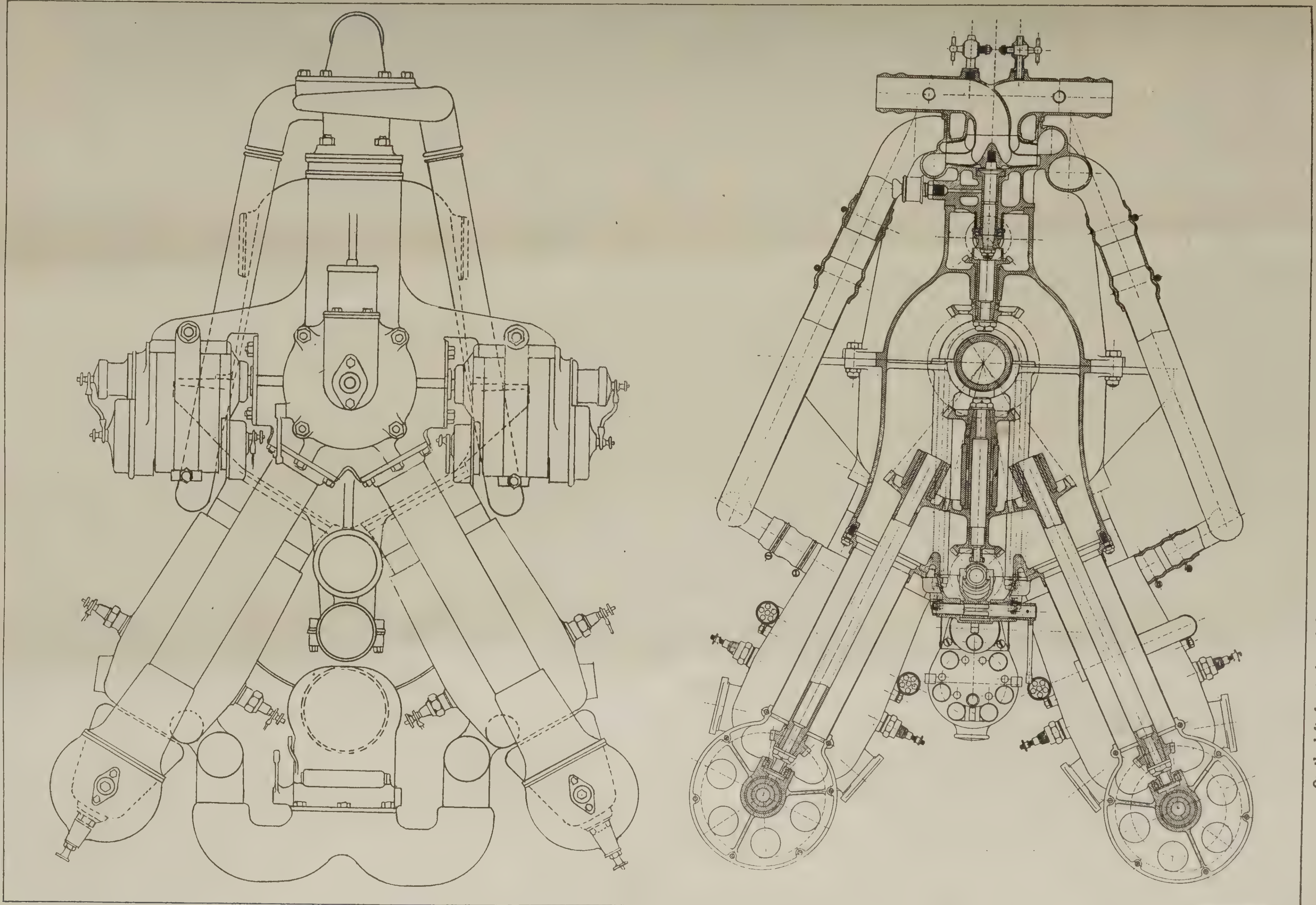
Aluminum Pistons

The pistons are of aluminum. They carry three concentric rings which are pinned at the ring gap. There is a deep annular rib between the piston bosses. The pistons are also unusually short, only 95 mm. (3¾ in.) in length. The piston pin is 38 mm. (1½ in.) in diameter, has a ⅛-in. wall and is locked with a single set screw and cotter pin. There are eighteen 11/32-in. holes drilled in the skirt for lightness and for oiling purposes.

The connecting-rods are of the Renault yoked type, and the short rod alternates from right to left cylinder from the front to the back of the engine. The rods are made of B. N. D. steel I-beam section, with flange and web 2 mm.



Fuselage of a French Boeguet bombing machine with a Renault installed.



On the left, front view of the 300 H. P. Renault, and on the right, front view of the 400 H. P. Renault.

thick. The flanges are 26 mm. (1 3/64 in.) and the web is 34 mm. (1 11/32 in.) wide. In the short connecting-rod both ends of the rod are alike. The length of the rod is 300 mm. (11 13/16 in.). The rod cap is secured by means of three bolts, two of 11 mm. (7/16 in.) diameter and one of 14 mm. (9/16 in.) diameter.

The crankshaft is carried in four babbitt-lined bronze shells, which in turn are secured to ribbed-steel bearing caps.

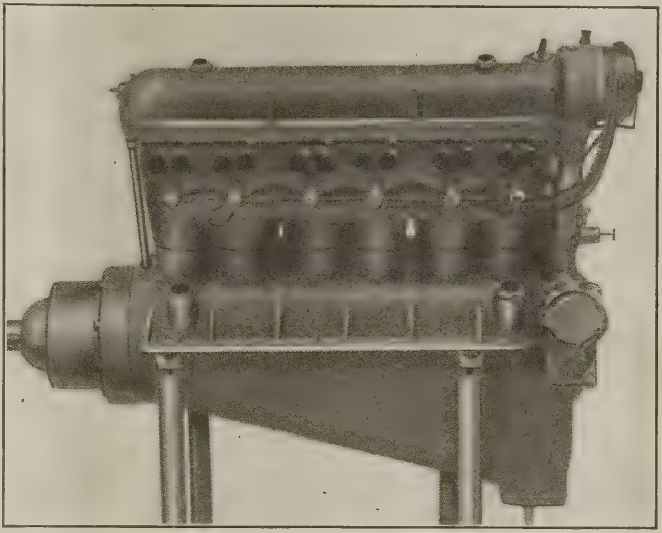
The bearing caps are secured to the top of the case by means of long U-bolts, such as are sometimes used on automobile spring-saddles. The crankshaft has a diameter of 60 mm. (2 23/64 in.) throughout, with the exception of the propeller shaft-end, where the diameter is increased to 68 mm. (2 43/64 in.). The crankpins and bearings are 72½ mm. (2 55/64 in.) long with the exception of the propeller and bearing, which is 92 mm. (3⅜ in.) long.

The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting-rod big-end bearings. The front end of the crankshaft is splined to receive the starting gear and accessory drive. The bottom half of the crankcase serves as an oil-pan and has a screen dividing it into two compartments. The water-pump is mounted at the front of the engine on the bottom half of the crank chamber, and has an especially designed double runner and double collector. The water is piped to both sides of the engine, through copper pipes, and rubber connections are interposed to prevent cracking of joints due to vibration.

The carbureter is of the single float type. Two carbureters are mounted on each side of the engine and bolted to the crankcase by means of long studs. The intake pipes, which are fastened to the carbureter by means of unions, are made of copper tubing 48 mm. (1 57/64 in.) in diameter.

The carbureter has a pair of primary nozzles, a pair of secondary nozzles and an auxiliary air valve, the latter consisting of an annular ring mounted concentrically with a venturi throat.

The oiling system is extremely simple. Oil is carried through cast ducts in the front and rear compartments of the crank chamber to the main bearings. It is also carried from these ducts through two copper tubes up to the overhead camshaft case, passes through the camshaft case and returns down through the distributing gear case to the oil sump.



The 400 H. P. Renault engine.

The valve gear is contained in a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages that form both the camshaft bearings and the rocker-arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 mm. (15/32 in.). The camshafts and the driving shaft are driven through straight bevel gears of 12½ mm. (½ in.) face. The inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allows their weight to be considerably decreased. This arrangement is cheaper and much lighter than that where a train of spur gears is used for driving magnetos and camshafts. Many other aviation engines use bevel gears for driving the camshaft, but few designers seem to have grasped the importance of operating the auxiliary shaft at high speed.

There are four magnetos mounted co-axially, each pair being driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto drive-shaft. The magneto drive-shaft terminates at its forward end in the sleeve of a bevel gear, and is provided with helical splines, so that when the shaft is moved longitudinally it is also moved angularly. This method of advancing the spark obviates the need for many connections to magneto breaker boxes, and also insures a spark of the same intensity, regardless of whether the ignition is advanced or retarded.

At the front end of the crankshaft is mounted an aluminum six-cylinder air-starting motor, which engages the crankshaft by an overrunning clutch. This air-starting motor has a single inlet and discharge valve for six cylinders, of the rotating disk type. A hand starting gear and the starting magneto drive are also built integral with this starter.

THE LATERAL DIHEDRAL

By WILLIAM R. D. SHAW

An English Aviator's Views on the Old-Established Aeronautic Principles.

This article is intended to bring out two important points:

(1) *In tractor biplanes only the bottom plane should have a lateral dihedral angle.*

(2) *When the principle of the lateral dihedral is being applied in a design, the designer must look to his weight distribution and avoid inclined virtual axes of inertia.* *W. R. D. S.*

NINE text-books out of ten give an erroneous explanation of this excellent principle. At least, that is what the writer finds to be the case in England. The stabilizing principle is not derived from the change in the projected plan area of the wings of an aeroplane as the latter rotates about its horizontal longitudinal axis. The right explanation is this: When the aeroplane becomes canted to one side, it tends to side-slip in the direction of the lower wing. The presence of a positive dihedral angle laterally enables this lower wing to derive a lifting force from the side-slipping velocity. At the same time the outer wing is depressed and the machine stabilized.

A tendency particularly noticeable when monoplanes were in vogue was for the wings to grow outward and upward from the center of gravity. This while it resulted in a smart appearance, was bad practice, because the centre of support became too high, and if the principle of the lateral dihedral is correctly applied the centre of gravity should be above the centre of support. The original Fokker monoplane—not the later copies of the Morane—was distinguished by the absence of any lateral controls, and this machine was admirably flown in gales by a lady as long ago as 1912. The high degree of lateral stability was obtained by a pronounced lateral dihedral angle in conjunction with an unusually high centre of gravity. Much of the rolling which is found in dihedral winged machines is caused by the objectionable little horizontal inward components of the varying air pressure on the wings. By employing a high centre of gravity these components are actually turned to useful purpose by contributing to the stabilizing action. All pendulum action and rolling is eliminated.

Again, in turning the centrifugal force with a high centre of gravity is found most useful in balancing the banking angle of the machine, and in the case of engine stoppage the aeroplane assumes a natural gliding angle. Of course, longitudinally it may be advisable to employ a rather larger tail with the high centre of gravity; this is a moot point.

The European War, in which the writer has had some 18,000 miles flying experience over what Britishers call "Hunland," has developed the tractor biplane as a more or less standard type. One, however, comes across machines of this type in which both upper and lower planes have both a lateral dihedral, others in which only one of these planes has the dihedral, and some having no dihedral laterally at all. Of these, the only type that deserves to survive is that in which only the bottom planes have a lateral dihedral angle. This makes for smart appearance, high factor of safety, and really means that while taking the machine as a whole the centre of gravity is not too high, and while considering only the bottom stabilizing dihedral plane the centre of gravity is high in relation to it. Such aeroplanes one frequently sees, but one wonders whether the designer had this point in mind when he evolved the machine.

It is not generally recognized how important a feature weight distribution is in

(*Continued on page* 790)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note. 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to S. C. Radio General Supply Depot, Atlanta, Ga.

Note 3—Report to S. C. Troops, Camp Green, Charlotte, N. C.

Note 4—Report to O. i/c District Finance Office, Keenan Bldg., Pittsburgh, Pa.

Note 5.—Report to Little Silver, N. J.

Note 6—Report to Camp Jackson, Columbia, S. C.

Note 7—Report to District Manager of Equipment, Detroit, Mich.

Note 8.—Report to Capt. M. H. Grace, Production Dept., Grand Central Palace, 46th St. and Lexington Ave., New York, N. Y.

Note 9—Report to District Manager of Equipment, 480 Lexington Ave., New York, N. Y.

Note 10—Report to Radio School, Austin, Tex.

Note 11—Report to Capt. J. N. Patterson, San Francisco.

Note 12—Report to Fort Kamehameha, Honolulu, Hawaii.

Special Orders Nos. 130 to 134, inclusive

A

Acheson, Alexander M.	TFT
Appleton, James L.	TFT
Atkinson, Harold K.	TFT
Anderson, Harold	SLR; EOT
Archer, Cecil Elmore	SLR; RSD
Anglin, Charles H.	PFO
Anderson, Emil S.	MAC
Ammel, Roy W.	CWT
Alexander, Wriston G.	CJW
Apple, Addison A.	FRF
Adams, James S.	FRF
Adams, William H.	FRF
Aldridge, William Southworth	SLR; LDT
Aven, William Ralph, Jr.	SLR; LDT
Austin, Calvin E.	FRF
Amberg, Irwin S.	FRF
Archer, Allan T.	FRF
Austin, Charles B.	FRF
Arnold, Ivan Thomas	SLR

B

Bruch, Louis Mason	SLR; CRI
Bonesteel, William Kenneth	SLR; RSD
Bullock, Edward L., Jr.	DMA
Black, Charles N.	CFT
Brown, Owen S.	FRF; DMA
Brooks, John P.	LHV
Barton, Paul W.	FRF
Boxell, Earl Francis	SLR; AAD
Berger, Earl O.	FRF
Bruce, Parker	FRF
Barnes, Robert Henry	SLR; CWT
Breckon, Leslie Stewart	SLR; RSD
Boothe, William H., Jr.	SLR; AAD
Bither, Tom A.	MAC
Barnes, Dwight F.	CWT
Booth, Harold W.	CWT
Bramlette, James L.	CWT
Burnet, Gilbert W.	CWT
Blackburn, Border	PFO
Braun, William P.	PFO
Burrucker, William C.	TFT
Buckley, Charles J.	TFT
Brofft, Randolph E.	TFT
Browne, Charles E.	TFT
Burr, Richard O.	TFT
Burns, George R.	SLR; AAD
Bullitt, Joshua F.	DIK
Baum, Frank H.	DIK
Buffigton, John F.	MAT
Brown, Harold L.	SLR; AAD
Brown, Henry J.	SLR; AAD
Biddle, Spencer	SLR; VBW
Black, Joseph Loyal	SLR; CWT
Blain, John Dean	SLR; RSD
Bender, Ned J.	FRF
Burr, Walter A.	FRF
Beehler, George H.	DIK
Buser, Albert Ervin	SLR; RSD
Barnes, Earl D.	DIK
Brannum, Claude J.	SLR; DIK
Burrows, Frank H.	DIK
Burnett, Hunter T.	FLT; DIK
Brew, Paul	TFT
Blackburn, Jack	TFT
Brayman, Kenneth C.	DIK
Boucher, Clarence K.	TFT
Pacon, Benjamin S.	FLT; DIK
Benjamin, Everett F.	FRF
Barnard, Albert	SLR; AAD
Baum, Frank Hutchins	SLR; KST
Bartholomae, William August, Jr.	SLR; AAD
Brady, Cletus J.	SMM
Borden, Joseph Louis	SLR; KST

Baker, Harold Henry....SLR; GLC
Bowen, Lewis L....FRF
Bush, Ralph R....RSD
Blackburn, Lloyd C....SMM
Baildon, John K....SMM
Bartlett, Treffley F....SMM
Breese, Clinton S....FRF
Bottom, Raymond B....LHV
Buckley, Francis J....SMM
Blackard, Charles G....SMM
Baxter, Donald K....CFT
Bisgood, Frederick Whitaker....SLR; LDT
Behel, Vernon W., Jr....FRF
Beach, Merritt S....FRF
Birnbaum, Bert J....FRF
Bliss, Carlton M....FRF
Braukman, Clarence A....FRF
Burch, Mark H....FRF
Boothe, William H., Jr....FRF
Burns, George R....FRF
Bauerfeind, Lanus E....EOT
Bockus, Harry N....FRF
Brown, Kenneth P....SLR; FRF; TFT
Baker, Harry Sargent....SLR; EOT
Burdick, Lorence Bushnell....SLR; EOT
Butler, Charles A....FLR; VBW
Brown, Christy ....SLR; DAP
Brown, Fred Le Roy....FLR; DAP
Boyd, George Winn....SLR; RSD
Beck, Daniel H....SLR; RSD
Bagley, James K....PFO
Benton, John William....SLR; RSD
Bralley, Ernest Meade....SLR; KST
Brewer, Percy Osborne....SLR; RSD
Brunner, Charles Felician....SLR; RSD
Blodgett, George Raymond....SLR; Note 8
Britton, Ralph R....DIK
Bradley, Timothy W....DIK
Burge, Kemp S....FRF
Buchanan, Thomas S....FRF
Bernard, Clifford Shaffer....SLR
Bird, Emerson Prall....SLR
Baskerville, Ralph Edwin....SLR

C

Crawford, Russell A....MAC
Crowdus, Walter C....FRF
Crane, George A....FRF
Chaney, James E....DMA
Codington, Arthur David....SLR; CAF
Caldwell, Frederick Wyllys....SLR; LDT
Chase, Lowell H....FRF
Calkins, Reginald Jackson....SLR; EOT
Collier, Ralph Phelps....SLR; CWT
Cauthen, James C....CWT
Cole, Robert A....FRF; CWT
Cox, Artie G....CWT
Cundiff, William I....DIK
Carpenter, Kenneth ....SLR; CRI
Carroll, Alonzo Marcellus, Jr....SLR; EOT
Colliver, Harry Forrest....SLR; AAD
Cartwright, Paul....SLR; AAD
Cohen, John ....DIK
Carryl, Frank M., Jr....PFO
Coffman, Lionel A....PFO
Corkran, Dudley C....PFO
Collier, Trezevant ....AAD
Cunningham, Samuel D....DIK
Calley, Charles Deane....SLR; RWT
Clark, Earland F....SLR; AAD
Coles, Paul D....TFT
Collier, Ralph P....DIK
Crehore, John D....DIK
Chamberlain, Leo W....SLR; AAD
Carter, John Owen....SLR; TFT
Cooper, Edwin Jonas....SLR; AAD
Clark, John B....TFT
Chanin, Charles G....TFT
Crawford, Noble Russell....SLR; TFT; FRF
Cleveland, Waldo A....DIK
Clark, Arthur F....DIK
Cutts, George B....FRF
Clark, Dunlap Cameron....SLR; FOB
Cleveland, Chester Emery, Jr....SLR; RWT
Claggett, Henry B....FRF
Croom, Marvin Earl....SLR; CRI
Crook, Wilson Walter....SLR; KST
Coulter, William A....TFT
Clements, Otis G....FRF
Charroin, Arthur B....DIK
Cole, Harold L....DIK
Conway, James V....DIK
Croxford, Frank D....FRF
Chapman, William Burr....SLR; LDT
Carberry, Joseph E....DMA
Cone, Charles L....FRF
Comly, John ....FRF
Collins, William Frederick....SLR; FOB
Corbet, Clinton Litchfield....SLR; RWT
Cantey, Samuel McGowan....SLR; GLC
Carroll, Earl ....FRF
Carter, John O....FRF
Crocker, Zenas, Jr....RWT
Cooper, Elmer E....FRF
Chance, Percival H....FRF
Clark, William J....FRF
Coffing, Lawrence D....FRF
Carscadin, Henry L....CFT
Christensen, Jens T....FRF
Costar, Lloyd ....SLR; RSD
Chatterton, Walter S....FLR; DAP
Crozier, George Haynes....SLR; Note 8
Cotton, John Bowman....SLR; RSD
Corbitt, Marsh Morgan....SLR; RSD
Cummings, Charles Milton....SLR; RSD
Croxson, Albert Milne....SLR; RSD
Clayton, George W....Note 3
Conlogue, John Augustine....SLR; LDT
Clevette, Charles F....DMA
Conrad, Carl Cecil....SLR; EOT
Chaplin, Winthrop L....DIK
Childress, Charles W....DIK
Connor, Richard M....DIK
Cann, Frederick Bowman....SLR
Clendinning, William R....Note 10

D

Dahle, Arthur William....SLR; CWT
Davis, Harold Clyde....SLR; CWT
Del Gaudio, Matthew W....RWT
Denham, Thompson Brooks S....FRF
Douglas, Bernard M., Jr....FRF; DIK
Dillaway, Manson M....PFO
Dinger, Harry A....MAC
DeVore, Kenneth L....CWT
Davis, Roy L....MAT
Delana, Edward K....TFT
Despain, Lawrence N....SLR; AAD
Dodds, Harry ....FRF
Davidson, Carlton F....FRF
Dimming, Howard ....TFT
Duckett, Thomas P....FLT; DIK
D'Arcy, James, Jr....TFT
Daub, Wade Gordon....SLR; EOT
Dickson, Hunter Adam....SLR; EOT
De Lany, Russell Wetzel....SLR; GLC
Daniel, Roy Petery....SLR; RSD
Duke, Daniel Fitzgerald....SLR; DIK
Douglas, Bernard Martin, Jr....SLR; PMT
Dawson, Charles B....FRF
Dievendorff, Horton Harold....SLR; RSD
Drougard, Valentine J....RWT
Dwyer, Martin James....SLR; AAD
Dodge, Walter E....FRF
Dugger, Eugene F....FRF
Des Champs, James W....CFT
Doyle, John C....SMM
Davis, Donald D....DAP
Drake, Chester M....SLR; DIK
Dreher, Raymond C....DIK
Duke, John F. S....DIK
Daniels, Julian Sinclair....SLR
Dorner, Earl Victor....SLR
Dougherty, Elmer Lloyd....SLR
Duncan, John Collins....SLR
Dixon, Rollin Lester....SLR
Dreher, Harland Brown....SLR

E

Ebright, Carroll Malcolm....SLR; RSD
Eastman, Byron Lee....SLR; RWT
English, Connell A....DIK
Ellery, Eugene, Jr....SLR; CRI
Emley, Ivan N....MAC
Ennis, Arthur I....DIK
Egan, Thomas M....DIK
Erickson, Harold ....SLR; DIK
Erickson, Fridjof C....SLR; DIK
Eustis, Edwin M....TFT
Everett, Aylett Lee....SLR; RSD
Elbart, Earl Walter....SLR; KST
Emerson, Sumner Brooks....SLR; FOB
Erlendson, Pjetur ....SLR; EOT
Elsey, George W....FRF
Eddy, John Leslie....SLR; TFT; FRF
Elliott, Marion L....FRF
Edler, Raymond C....FRF
Ewing, Henry G....FRF
Egbert, Perry T....DIK
Eccleston, Henry B....SMM
Edwards, Claude R....SMM
Eyman, Bradford ....FRF
Edwards, George Boardman....SLR; Note 8
Ellyson, James Kemper....FLR; DAP
Evans, Edward Lawrence....SLR; DAP
Eldridge, Royal Arthur....SLR
Etnyre, Mentor ....SLR

F

Fulwiler, Howard D....SLR; KST
Fenton, Daniel H....SLR; RTR
Fulwood, Charles Wesley, Jr....SLR; RWT
Fry, John Oscar....SLR; CRI
Fields, Frank Eugene....SLR; KST
Fauvre, Irving Maus....PFO
Foreman, Carrol L....DIK
Fox, Arthur W....CWT
Fenno, Jesse K....MAC
Farrell, John B....DIK
Fitzhugh, Thomas C....BST
Frankfort, Frederick ....FRF
Foster, Arthur L....MAC
Fuller, Robert N....SLR; AAD; FRF
Farrar, Delwin B....PFO
Fause, Leroy H....DIK
Fitzgerald, John J....FRF
Fish, Eugene R....PFO
Ferguson, George F....FRF
Farnsworth, Augustus P....TFT
Frost, John W....TFT
Fay, George H....DIK
Fitzgerald, Harold Alvin....SLR; TFT
Farthing, Welbourne Owens....SLR; KST
Few, Lindsey D....FRF
Farris, Homer Virgil....SLR; RSD
Frost, John Austin....SLR; RSD
Farnum, William Cushman....SLR; FOB
Frisbie, Hallet Burtrand....SLR; EOT
Frankley, Lawrence William....SLR; RSD
Foster, Roy W....RSD
Fillmore, William H....FRF
Ferris, Walter Cutler....SLR; Note 8
Frank, Stuart H....DAP
Frindel, Samuel, Jr....DAP; Note 2
Flather, William James....SLR; MDO
Ford, Lewis E....DIK
Ferris, George M....DAP
Frandsen, Arthur S....MAT

A German Gotha captured by the French Air Service in the environs of Paris. (French Official Photo)

Fall, Harold Andrews	SLR
Flinn, Earle Frank	SLR
Ford, Lewis Eastman	SLR
Fraser, Walter	SLR
Frink, George Willis	SLR

G

Gheen, Raymond Fearson	SLR; CWT
Gay, Ernest Hubbard	SLR; RWT; FRF
Givens, James Douglas	SLR; AAD
Gibson, James R.	TFT
Griffith, Fred C.	TFT
Grimes, Gerald E.	TFT
Graicunas, Vytautas A.	TFT
Grosh, Emmett K.	WFO
Goree, Jonathan D.	SLR; AAD
Gooding, Carlos C.	DIK
Grady, Harold H.	DIK
Gibson, Peyton	FRF
Greer, John E.	FRF
Ghee, Milton P., Jr.	DIK
Green, Dwight H.	DIK
Gordon, James B.	SLR; AAD
Garesch, Claude F.	DIK
Grasse, Carl A.	FRF
Giddings, Joseph A.	FRF
Gilman, Harold A.	FRF
Gormley, Richard R.	FRF
Graven, Carl M.	FRF
Gunn, Roy E.	FRF
Golonsbe, George J.	FRF
Graham, Charles, Jr.	FRF
Goode, Henry Walton	SLR; RSD
Griffin, James L.	FRF
Grady, Henry L.	FRF
Graven, Carl M.	DIK
Gordon, Charles	Note 6
Goodnow, Wallace Field	FLR; CMV
Goble, Amos Howard	FLR; Note 7
Gale, James Cloyd, Jr.	SLR; RSD
Gallup, Burton A.	DIK
Gilbert, Charles T.	DAP
Gandy, Robert L.	FRF
Goree, Rogers C.	FRF
Goldsborough, William C.	MAT
Graham, Harland Brown	SLR
Graham, Audrey William	SLR
Gilchrist, Hugh Robert	SLR

H

Haddock, James Perry	SLR; RSD
Halley, Harold A.	FRF
Hockett, Roland R.	FRF
Harding, Roy Edmond	SLR; RSD
Herrmann, Gerald Francis	SLR; RSD
Hersleff, Sigard N.	DIK
Hereford, Herbert W.	FRF
Hough, Roscoe R.	SMM
Huffman, Carl F.	CFT
Halsey, Oscar Lawrence	SLR; DAP
Hawks, Horace Gilmour	SLR; KST
Hopkins, Edward James	SLR; KST
Hogue, Mark Campbell	SLR; RSD
Hayes, Perry	SLR; CWT
Heath, Edward Phillips	SLR; CWT
Hoffman, Malvin Gerald	SLR; KST
Hunter, Archie Dean	SLR; KST
Holmes, Henry K.	Note 4
Hall, Edwin P.	DIK
Hunt, Gilman Charles	SLR; CWT
Harris, Allan B.	MAT
Hostetler, Wilbur D.	MAT
Hyland, George N.	MAT
Hyde, Jules V.	DIK
Haggerty, Lyman Hale	SLR
Howard, Lynn Frederick	SLR
Howard, Raymond Edward	SLR
Hendrickson, Charles G.	Note 12
Henderson, Paul Raymond	SLR; KST
Hands, Stanley Moore	SLR; CRI
Henry, Percy Claney, Jr.	SLR; RSD
Haney, Wayman	MAC
Hardie, John F.	PFO
Harrington, Henry G.	PFO
Hurd, Mark M.	PFO
Hebbard, Charles B.	DIK
Harvey, Harold M.	FRF
Hoyt, Fred D.	MAC
Hooper, James Clinton	SLR; KST; FRF
Heffner, Paul	SLR; AAD
Hadley, Lawrence Burton	SLR; AAD
Heafer, Harold W.	TFT
Hebberd, James L.	TFT
Himebaugh, Gero A.	TFT
Hoefgen, Leonard E.	TFT
Hooper, Harley L.	DIK
Hickmott, John T.	FRF
Horrell, Camden R.	TMA
Houlton, Raymond C.	DIK
Harwell, Gordon L.	MAT
Headley, Mervin E.	DIK
Hogland, Alander F.	MAT
Harkins, Samuel W., Jr.	MAT
Hart, John F.	CWT
Holmes, Robert B.	CWT
Haywood, Chester B.	FRF; DIK
Hayden, Max Ernest	DIK
Haserot, Francis Samuel	SLR; CWT
Helmerich, Walter Hugo	SLR; KST
Helgesson, Henry Theodore	SLR; RSD
Hellman, Richard Hoge	SLR; RSD
Harpel, Gates	SLR; EOT
Harris, William L.	FRF
Hackett, Frank D.	MAT
Hickman, Horace M.	FRF
Holladay, Daniel M.	TFT
Hood, Daniel G.	TFT
Haddorff, Carl L.	DIK
Harpham, Edwin Lynn, Jr.	SLR; KST
Henderson, Jacob Earl	SLR; TFT; FRF
Hill, John P.	FRF
Howard, Thomas D.	FRF
Hoyt, Werner Fletcher	SLR; RSD
Howard, Harold Harmon	SLR; RSD
Hotchkiss, Edward Gillette	SLR; FOB

I

Inlow, Walter Thomas	SLR; CWT
Ingraham, Forrest W.	PFO
Ingle, Joseph L.	TFT
Ingersoll, Hamilton	RWT
Innes, William Wallace	SLR
Isbell, Henry W.	Note 6
Ingraham, Elmer Clarke	SLR

J

Jaynes, John Belmont	SLR; EOT
Jones, Stanley B.	FRF
Johnson Courtlandt S.	CWT
Jones, Elmer H.	CWT
Jackson, Joseph W.	TFT
Johnson, Joseph K.	TFT
Jacobs, George S.	DMA
Jones, Lawrence M.	DIK
Jones, Clifford E.	PFO
Jaccard, William N.	SLR; AAD
Jenkins, Nelson D.	DIK
Jaggard, Robert Kenneth	SLR; KST
Jacomini, Clement, Jr.	SLR; RSD
Jones, Ira Milton	SLR
Jennings, George A.	FRF
Jones, Theodore C.	MAT
Johnson, Laurence S.	FRF
Jaques, Gordon F.	CAF
Jacquemart, Eugene Arthur	SLR; RSD
Jones, Paul	FLR; DAP
Jack, Butler, Jr.	MAT
Jaenke, William D.	MAT
Jones, Howard H.	DIK
Jennison, John C.	SLR; DIK
Johnson, Victor H.	DAP
Jenkins, Ned Walter	SLR
Jacobs, John Frank	SLR
Jones, Vivian Maxwell	SLR
Justice, Philip Syng	SLR

K

Kiely, Daniel	DIK
Kinney, Morris	TFT
Kier, Samuel Max	SLR; AAD; FRF
King, Charles D.	DIK
Knupp, Glenn H.	SLR; FRF; AAD
Kindig, Theodore P.	TFT
Knerr, Hugh J.	GLC
Kirby, Samuel Bonner, Jr.	SLR; KST
Kelly, Harold R.	CFT
Klingensmith, Ward C.	DIK
Kelly, Bernard H.	PFO; FRF
Kinder, Roland H.	SLR; AAD
Knox, Merton Hugh	SLR; KST
Kelly, Ralph Morse	SLR; RSD
Kingman, Spencer S.	MAT
Keeler, John F.	SLR; FRF; AAD
Kramer, George E.	SLR; EOT
Kendrick, Aaron T.	FLT; DIK
Kloke, Carl P.	SLR; DIK
Kittell, Mellon F.	TFT
Knickel, Walter Clayton	SLR
Kohr, Hugo John	SLR
Kiefner, Charles E.	CFT; FRF
Keeling, Walter S.	CFT
Kinney, Judson S.	FRF
Kauffman, Carl R.	FRF
Kent, Thomas T.	FRF
Kennedy, William Edward	SLR; TFT; FRF
King, Alexander M.	FRF
Keith, Jerome	FRF
Halloran, Earl T.	FRF
Knapp, Robert D.	FRF
Kuhlke, John R.	SLR; KST
Kennedy, Robert Joseph	SLR; DAP
Kennedy, Robert Emmett	SLR; KST
Kievlan, Charles Edgar	SLR; EOT
Keohane, John Michael	SLR
Kinney, Charles Lafayette, Jr.	SLR

L

Lynch, Frederick Dan	SLR; CRI
Lile, Richard Leon	SLR; ELA
Lees, Herbert C.	TFT
Lobdell, Jacob K.	TFT
Loud, Harold E.	TFT
Littlefield, Robert Clement	SLR; KST
Lowell, George Clough	SLR; RSD
Longstroth, Marshall	MAC
Laubenfels, Clarence R.	DIK
Long, William F.	DIK
Loder, James Augustus	SLR; RWT; FRF
Lowenstein, Milton D.	SLR; AAD
Lipscomb, McDonald E.	TMA
Lawton, Merritt L.	SLR; DIK
Laird, Homer U.	FLT; DIK
Locher, Edward O.	DIK
Leib, William F.	SLR; DIK
Lenoir, Whitman Hill	SLR; FRF; DIK
Locher, Edward Orrick	SLR
Logan, William Lindsey	SLR; DIK
Lyman, Richard Sherman	SLR
Lewis, Harold McQuade	SLR; KST
Liggett, Arthur G.	FRF
Leonard, John Lawson	SLR; FRF; RWT
Lundgren, Theodore S.	FRF
Lansing, Jack C.	FRF
Levitt, Morse D.	FRF
Lansing, Jack Courtney	SLR; TFT
Lewis, Richard P.	SMM
Lownsberry, Guy T.	FRF
Lavelle, Michael J.	SMM
Long, Carl C.	SMM
Lindsley, Dan Leslie	SLR; RSD
Lawson, William Eric	SLR; RSD
Leonard, Cecil Ebenezer	SLR; RSD
Lisenbee, George M.	DAP
Lamb, Howard E.	SLR; DIK
Lister, Harold Reid	SLR
Lund, Paul Svenny	SLR
Lundgren, Edgar Emanuel	SLR
Lathrop, Charles Gillette	Note 11

M

Midyette, Dayton Ralph, Jr.	SLR; RWT; FRF
Martin, David M., Jr.	TFT

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Kamesaburo Yamashita, a Japanese multi-millionaire, who recently demonstrated his patriotism by presenting to the Japanese Government one million yen to be used for the purchase of aeronautical equipment. (Japanese Official Photo)

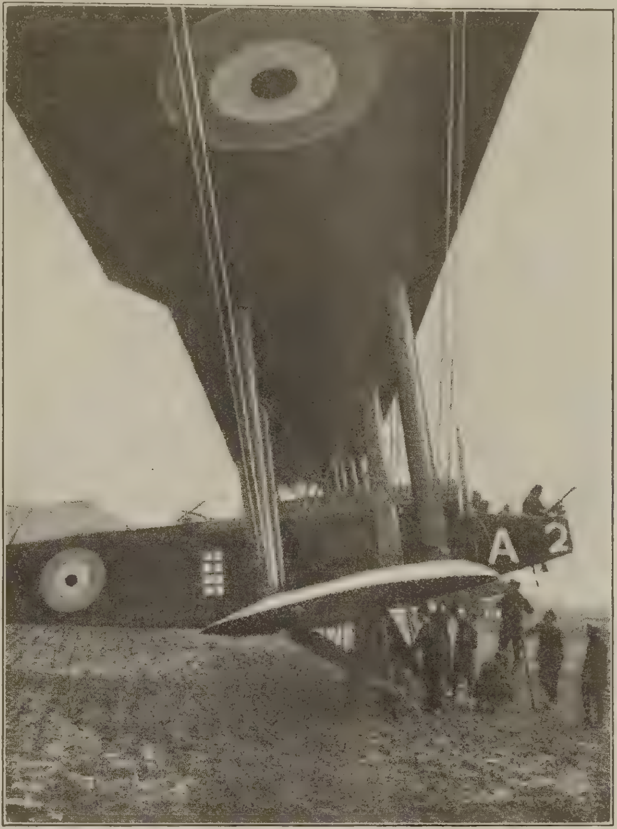
Maxwell, Maurice F.	TFT
Miller, Rolfe T.	TFT
Mitchell, Raymond A.	TFT
Marschak, Isidor	SLR; RWT
Madden, John H.	CWT
Milburn, George J.	CWT
Miller, Frank M.	PFO
Manning, Lucius	MAC
Murray, Charles Bellan	SLR; CWT
Morison, James C.	TFT
Moses, Lester E.	TFT
Minter, Clark C.	DMA
Mills, Robert R.	SLR; AAD
Miller, Henry B.	SLR; DIK
Miller, William F.	DIK; FRF
Marshall, Furber I.	SLR; AAD
Morris, Harley	SLR; AAD
Monteith, Percy L.	DIK
Murphy, Ralph Joseph	SLR; AAD
Metcalf, Frank	PFO
Maitland, Lester James	SLR; RWT
Morris, David Benjamin	SLR; RWT; FRF
Murphey, Harvey William	SLR; AAD
Moore, Robert G.	SLR; FRF
Matthews, David Robert	SLR; RSD
Moore, Maurice H.	FRF
Midkiff, Robert Forrest	SLR; KST
Mihleder, Philip George	SLR; TFT; FRF
Mahoney, Frank Herbert	SLR; EOT
Magna, Joseph Nicholas	CPR; CSO
Marshall, Charles Clark	SLR; TFT; FRF
Marshall, Howard Pearons	SLR; TFT; FRF
Mansell, Isaac E.	FRF
Miller, Lester J.	TFT
Mahon, William L.	DIK
Manning, Lucius	SLR; RSD
Martin, Robert	FRF
Mathews, John J.	FRF
May, Elmer N.	FRF
Mellor, Lloyd E.	FRF
Metcalf, Arthur B.	FRF
Moore, Harold Amos	SLR; RSD
Moores, Kenneth Albert	SLR; RSD
Mapes, Gordon Walter	SLR; LDT
Marsh, Edgar Clark	SLR; RWT
Marshall, William Jefferson	SLR; RSD
Moon, Odas	FRF
Mackie, Perle	FLT; DIK
Meyer, Emil A.	CFT
Miller, Marion Lewis	SLR; CWT
Morris, Charles G.	DIK
Murphy, Charles S.	FLT; DIK
Morgan, Herbert P.	FRF
Munson, Clinton G.	SMM
Morsch, Jesse Julius	SLR; RSD
Muckley, Robert Latour	SLR; CWT
Miller, Samuel H.	REL; CSO
Marsh, Albert E.	MAT
Mess, Robert W.	MAT
Mulvihill, Mead J.	MAT
Martel, Alfred, Jr.	SLR; RSD
Manselman, Earle H.	SLR; DIK
Murray, H. Sinclair	DIK

Mc

McDonald, Samuel F.	PFO
McCall, Carlton C.	TFT
McHenry, Arthur J.	TFT
McElin, Bertrand J.	DIK
McNamara, Lawrence Joseph	SLR; RWT
McLaren, William B.	MAT
McNaught, Roy J.	DIK
McDonald, James F.	FRF; DIK
McKay, Woodrow	DIK
McAllen, William Daniel	SLR; RSD
McCabe, Roscoe Ellis	SLR; RSD
McCulloch, John Myers	SLR; RSD
McMullen, Alexis Brenier	SLR; RSD
McClory, Harry G.	DIK
McAuliffe, William F.	FRF
McCoy, Dell H.	FLR; DIK
McNaught, Roy J.	FRF
McLaughlin, Oscar F.	CAF
MacDowell, Bruce A.	LHV
McBride, Howard I.	FRF
McLellan, Hiram J.	FRF
McMurphey, John W.	FRF
McKenna, Edmond P., Jr.	FRF
McFarland, John J.	FRF
McCabe, Alfred S.	DIK
McGovern, John E.	MAT
McKinney, Oakley Walls	SLR; EOT
McCrillis, Jacob Wilson	SLR; RSD
McMillin, Henry Everett	FLR; DAP
MacMechan, Dunbar Deane	SLR; LDT
MacLaren, Clyde Athol	FLR; CMV
McQuiston, Rolla Hunter	SLR; DAP
McRae, Harry Botsford	SLR; CWT
MacLeod, Norman Langley	SLR; WDM

N

Niblack, Polk Howard	SLR; RSD
Norton, Rolla W.	FRF
Nethercut, William R.	DIK
Niles, Edward A.	MAT
Nissager, Fred D. M.	DIK
Nunenmacher, Francis Warren	SLR; RSD
Nietz, Adolph H.	FRF
Nealy, Forrest H.	TFT
Nunn, Theodore W., Jr.	DIK
Nims, Homer Willis	SLR; RSD
Nulsen, Norman Lee	SLR; CWT
Nash, Roland Lewis	SLR; KST
Norris, James K.	FRF
Neely, John H.	FRF
Neely, Eugene A.	DIK; FRF
Nunn, William Theodore	SLR; RWT
Neal, Marshall S.	FRF
Nelb, Alfred W.	FRF
Newman, Robert E.	FRF
Nissager, Fred David	SLR; HHN



A British Bombing plane being tuned up and loaded with bombs on the eve of making a bombing raid into Germany. (British Official Photo)

O

O'Brien, James H.	DIK
O'Neil, Joseph H.	CWT
O'Leary, Max	SLR; RWT
Otis, Edward G.	MAT
Osborn, Thomas W.	SLR; AAD; FRF
Organ, John David	SLR; KST
Ogilvis, Alexander E.	DIK
Owen, Ross G.	DIK
O'Malley, Edward Lewis	SLR; CWT
O'Briant, Luther	SLR; CWT
Oliver, Walter Lloyd	SLR; RWT; FRF
Ordway, William F.	FRF
Oakes, Gail C.	SMM
Olds, Harvey R.	MAT
O'Hanley, Myron Emmett	SLR; RSD
Ober, George Billings	SLR; EOT

P

Peirce, Gowen	SLR; RWT
Putnam, Russell Lorain	SLR; PMT
Palmer, Hubert Phillips	SLR; KST
Pace, Floyd A.	PFO
Philbrook, Jacob B.	TFT
Palmer, Walter	TFT
Parker, Albert N.	TFT
Perry, William L.	TFT
Parks, Ralph O.	FRF
Palmer, James E.	MAC
Pearson, Wallace D.	SLR; AAD
Phillips, Walter P.	DIK
Parrott, William G.	MAT
Pilcher, Rufus J.	CWT; FRF
Philips, Enoch Anderson	SLR; RWT
Pennington, Jerome E.	FRF
Pinkstaff, Everett W.	FRF
Purcell, William L.	TFT
Paine, Grosvenor R.	DIK
Porter, Louis H.	DIK
Pollard, Thomas G.	DIK
Parish, Cheaney Land	SLR; RSD
Payne, Bryan Watson	SLR; RSD
Parker, Reed Lynn	SLR; MDO
Prosser, Stuart Alexander	SLR; TFT; FRF
Paine, Topliff Olin	SLR; AAD
Paegel, Hollis Arthur	SLR; CWT
Powell, Charles S.	FRF
Pemberton, George Herbert	SLR
Petticord, Leslie L.	CFT
Peterson, Tenny C.	SMM
Payne, Halbert Edwin	CPR; DAP
Purdy, Donald F.	SRC
Patrick, Charles Colin	SLR; DAP
Pratt, Henry C.	FRF
Pieron, Anton	SLR; CSO
Price, Henry Wales	SLR; CWT
Page, Henry L.	DIK
Pfeifer, Carl B.	DAP

Q

Quinlan, Charles G.	DIK
Queen, Harold E.	MAC

R

Robertson, Archie Mac Intyre	SLR; CRI
Robinson, Clarence Abraham	SLR; AAD
Reilly, Walter S.	FRF
Robinson, Frederick A.	SLR; AAD
Rough, Howard F.	MAC
Ross, Leslie H.	RWT
Richards, Walter Eugene	SLR; RSD
Reavis, Carlos Loretto	SLR; RSD
Ronan, John A.	SLR; AAD
Ray, Paul M.	TFT
Reiss, George S.	TFT
Ristig, William B.	TFT
Roby, Townsley N.	TFT
Royce, Walker W.	TFT
Russell, Emerson C.	TFT
Ratliffe, George T.	TFT
Romans, Edgar D.	FRF; DIK
Richman, G. Raymond	MAC
Rowe, Harold D.	FRF; DIK
Riddle, Earl G.	PFO
Ransom, Harold B.	DIK
Rice, William T.	VBW
Reges, Charles H.	FLR
Reber, Alvin D.	FRF
Read, James K.	FRF
Ryniker, Milton E.	SLR; DIK
Rentfrow, Frank M.	DIK
Rowe, Ralph S.	TFT
Redfield, Alfred W.	TFT
Roberts, Gerald I.	DIK
Rossiter, Edner M.	DIK
Ryan, John Newman	SLR
Royer, Walter Earle	SLR; EOT
Root, Homer Boice	SLR; RSD
Ratekin, Otis Benjamin	SLR; EOT
Ratcliffe, Kent E.	SLR; RSD
Reynolds, George H.	FRF
Ryan, Robert	SLR; CWT
Rabbitt, Ora Clyde	SLR; LDT
Rollins, Carson W.	CFT
Roberts, Roscoe O.	SMM
Rummel, Jay Arnold	SLR; CWT
Ridley, Oscar T.	SMM
Robertson, Arthur	SMM

(Continued on page 793)

FOREIGN NEWS

FRANCE

The French official for June 14th says:

"Our chasing air squadrons have brought down five aeroplanes and two captive balloons. Seven other German machines have been put out of action.

"During the night of June 13-14 our bombing squadrons dropped on establishments, stations and cantonments in the enemy zone nineteen tons of explosives, causing important damage."

The inauguration of aerial postal service between Paris and London resulted in a tragedy, when Capt. Pierron, the famous French airman, and Lieut. Rousseau were killed at Hounslow while flying from France.

They had almost reached their destination when for some unexplained cause the machine suddenly crashed to the ground.

On June 16th Sub-Lieutenant Nungesser celebrated his promotion as an officer of the Legion of Honor by bringing down two three-seated aeroplanes, making his total of enemy machines worsted in battles thirty-eight.

The French War Office announcement issued June 17th says:

"In the last five days thirty-two enemy machines have been brought down or compelled to land out of action. Four German aeroplanes were brought down by our anti-aircraft guns, and three captive balloons were set afire. During the same period twenty-two tons of projectiles were dropped by day and night on the stations at Soissons, Roye, Nesle, and Chaulnes."

Adjutant Quette, the French aviator, who has downed ten German aeroplanes, has been missing since June 5. He was officially proclaimed an ace June 4.

The War Office announcement of June 19th says:

"There was no event of importance during the course of the day.

"On June 18 our air squadrons brought down or put out of action six German aeroplanes and set fire to one captive balloon. Our bombing machines dropped ten tons of projectiles last night on railway stations, cantonments and bivouacs in the region of Villers Franqueux, Faverolles and Fismes."

The Germans have attempted fourteen air raids upon Paris since January 31, but only twenty-two of the more than three hundred machines which took part in them have succeeded in flying over the city, according to a record of the enemy efforts published in the Excelsior of June 19th.

The newspaper comments upon the effectiveness of the aerial defenses of Paris thus indicated. Nine of the twenty-two machines which penetrated the barrier, it adds, were brought down by the French defenders of the capital.

Eight hundred and thirty-five German aeroplanes have been destroyed since January 1, according to an official statement which has just been issued by the French on June 20 and which tends to prove that the German communiqués are not reliable when dealing with losses of aeroplanes.

The statement says that on June 2 the Germans lost forty-eight, while on June 9 and 10 there were forty-nine of their machines brought down. The British were responsible for the destruction of thirty-three of those lost on the latter date.

The German official statements acknowledged the loss of ten on June 2 and eight on June 9 and 10.

The monthly losses during the present year follow: January, France 20 and Germany 78; February, France 18 and Germany 79; March, France 50 and Germany 186; April, France 46 and Germany 136; May, France 60 and Germany 356.

GERMANY

The German official for June 14 says:

"Twenty-eight enemy aeroplanes were shot down yesterday. The losses of the enemy's air forces on the German front for the month of May amount to twenty-three captive balloons and 413 aeroplanes. Of the aeroplanes 223 fell behind our lines and the rest on the other side of the enemy's positions. We have lost in air fighting 180 aeroplanes and twenty-eight captive balloons."

The German statement for June 16 says:

"Twenty-eight French and British machines were shot down by the Germans Thursday.

The official communication from German General Headquarters on June 18 says:

"Eight enemy aeroplanes and eight captive balloons were brought down yesterday."

June 19th's report from German General Headquarters says:

"Twenty-three enemy aeroplanes and three captive balloons were shot down yesterday."

GREAT BRITAIN

The report issued by the War Office on June 14 dealing with aerial operations reads:

"On Thursday low clouds and poor visibility impeded work in the air, but our machines took advantage of spells of clearer weather to make observations for artillery fire and to carry out numerous patrols and reconnaissances. Nine tons of bombs were dropped by us on the Zeebrugge mole, on the Armentieres and Comines stations and on targets in the French battle area.

"Ten hostile aeroplanes were destroyed during the day and two were driven down out of control. In addition, a German balloon was brought down in flames. We lost five machines. A heavy mist prevented flying during the night."

The British report of June 16 says:

"On June 15 and 16 the Royal (British) air force dropped more than 300 bombs and fired more than 25,000 rounds of machine gun ammunition on troops and transport attempting to cross the Piave."

The official report for June 17 on the work of the British airmen says:

"The uncertain weather interfered with our operations Sunday. The enemy aircraft were active at times on the northern portion of the British front and in the French battle zone.

"Eleven hostile machines were destroyed in air fighting; nine were disabled and one German balloon was shot down in flames. In addition, one hostile machine was shot down and another driven down out of control by anti-aircraft fire.

"We lost ten machines Sunday, six of which were working south of Montdidier.

"We dropped twenty-two tons of bombs by day and twelve tons Sunday night, heavily attacking the railways at Armentieres, Estaires, Comines and Courtrai and the docks at Bruges. Two of our night-flying machines failed to return."

According to the report of June 17 the Royal Air Force in bombing operations into Germany severely damaged military targets at Thionville, Metz-Sablons, and other points, says an official summary.

The railway station and sidings at Thionville, were attacked four times and several direct hits were made on the station. An explosion was caused near the Carlshutte works there. Two attacks were made on Metz-Sablons and a train there received a direct hit. Some three and a half tons of bombs were dropped on the railway sidings at Karthaus and the railways and munition factories at Hagendingen and Dillingen.

All British machines returned safely from all the expeditions.

The British official report says:

"On June 17 the enemy's machines were active on the northern portion of the British front, and there were many combats in the air, in the course of which we destroyed twenty-five German aeroplanes and drove three down out of control. One hostile balloon was shot down in flames.

"The usual observation and photographic work was carried on by our aircraft until stopped by thunderstorms in the afternoon.

"Twenty tons of bombs were dropped during the day on the enemy's railway stations, junctions, dumps and aerodromes, and a further nine tons the following night. Five of our aeroplanes are missing.

"Extensive damage also was done by our seaplanes in the period between June 13 and June 16. The docks at Zeebrugge, Ostend and Bruges, the Thourout Railway station and aerodrome, the Ghistelles aerodrome and the Bourgeoise works at Aertrycke were targets for bombs dropped by the aviators.

"Good results were obtained and hits were observed in the Chasse Basin, the railway station, the docks, the Leopold Basin, the Frederick Battery and the lock gates at Ostend. Fire was started in buildings at the junction of the canal and the Leopold Basin.

"Bursts were also observed on the mole at Zeebrugge and near the lock gates. At Bruges bursts were seen on the northeast quay, alongside the west basin, on the northern floating wet dock, on the east side of the dock and between the north and east quays, as well as at the south end of the east basin. The railway at Thourout was also hit.

"Bombs were dropped on an enemy vessel. During the same period, notwithstanding unsuitable weather, the aerial fleet was active in home waters in anti-submarine escorting and in aircraft patrol. Hostile submarines were sighted by the seaplanes, aeroplanes and airships, which also attacked enemy mines and destroyed them. Allied and neutral shipping was also convoyed by the aerial fleet."

The official statement on aerial operations issued June 19 says:

"It was cloudy Tuesday, but we were able to get observation. In the air fighting we destroyed fifteen German machines and disabled five. Eight of ours are missing.

"Nineteen tons of bombs were dropped in the course of the day. A heavy rain at night prevented flying."

The entrance to Zeebrugge harbor is blocked, according to Lieuts. George Coward and John Read, of the British Royal Air Force, who landed in the province of Zeeland and are to be interned at The Hague.

In an interview published in the "Telegraaf" they say the Germans are working day and night to clear the passage, but each night British aviators demolish the Germans' progress.

The cement ships sunk in the harbor are still there and the Germans are afraid to blow them up for fear they will also destroy the sluices. The lieutenants assert that no submarines can enter or leave Zeebrugge. The blockade of Ostend is not so complete, but the Germans are having great trouble there.

The Peerage of the United Kingdom has been conferred to Sir William Weir, Secretary of State for the Air Forces, according to an official announcement.

Sir William was appointed Secretary of Air Forces last April in succession to Lord Rothermere, brother of Lord Northcliffe. He previously held the post of Director General of Aircraft Production, and at one time was Scottish Director of Munitions. He is forty-one years old.

The British report aerial operations on June 20 as follows:

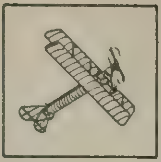
"A British squadron while on reconnoissance north of Helgoland Bight on the morning of June 19 was attacked by German aeroplanes. No hits were made by the enemy. One enemy seaplane was brought down and destroyed by gunfire.

"Low clouds and rain interfered with flying and the enemy aircraft showed little activity.

"Nine German machines were destroyed during the day and two were driven down out of control. One of our machines is missing."

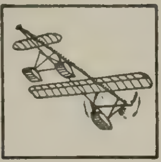
The admiralty on June 14 issued the following official statement on naval aerial operations:

"During the period of June 10-12 the operations of our air force contingents have been attended by unfavorable weather. In addition to the usual patrols, bombing operations were carried out day and night against Zeebrugge, the Bruges docks and the Ostend docks. In all eighteen tons of bombs were dropped. Two hits were observed on the Mole and bursts on the seaplane shed at Zeebrugge and at Bruges. Fires were caused at several places. Hits also were observed at the Brugeoise works, and bursts were observed at the Bassin de la Marine and the Gare Maritime, Ostend. Clouds at times prevented observation. One enemy aircraft was destroyed. One of our machines is missing."



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

WE will now turn to the twin propeller "Pusher" model, known to Model Flyers as the long distance racing type. The model is best suited to our course, because on account of its long flights it allows us to study the aeroplane in the air.

This type differs from the Tractor as to shape and ease of control. The balancing of this model is easier to overcome than any other type, because, in order to locate the centres of lift, etc., properly, it is only necessary to give a greater or lesser angle of incidence to the front plane, which is known as the elevator. From this we see that we need not move the planes to balance the machine.

Of course, this is the easiest way, the better way would be to arrange the planes at different points until the most efficient combination has been worked out using as little angle of incidence as possible, because a greater angle would present a greater area of resistance to be overcome.

So, for the reasons mentioned above, this model is the most popular with Model Flyers. Some, more experienced Model Builders, detest the idea of using their time to the building of the racing type because it does not resemble the large machines, but I think this is a rather foolish way to look at it, because a long distance flying model not alone gives a good chance to study areoplane flight but gives a good amount of enjoyment.

There is no prettier sight than a racing model high in the air traveling in a straight line to the farthest point, driven by its simple rubber power, and after power has gone the graceful glide, sometimes in large spirals, back to earth.

The construction of the racing model varies but little from the other type, the frame is constructed much the same as the tractor, only one end is separated by a strip of wood which the two propellers are mounted.

The frame is a sort of "A" shaped, the long sticks are 36½" long and made of 5/16" x ¼" spruce. One end of each stick is cut at an angle as shown in the drawings, a notch being cut out of the other ends.

Now bend a piece of wire to the shape shown at Figure 3. This is the terminal for the attachment of the rubber motors.

Bind the sharp ends of the sticks and the hook together in one operation with strong linen thread and glue as shown in the enlarged sketch.

The strip of wood for the propeller hanger is next put in place, this strip is 12" long and ½" wide at its widest point and tapering to ¼" at the ends. The thickness of this strip is ⅛". It is fastened with thread and glue. Next, put the cross strips of bamboo in place at about the center of the frame. These are made of strip bamboo about ⅛" thick and are for bracing the frame.

The bearings for the propellers are next made from 2 pieces of 1/16" inside diameter brass tubing ¾" long and two pieces of thin brass about ¼" x 1¼". (The long prongs of a brass paper fastener may be used for this purpose.) Now bend the brass strip and solder to the tubing as shown at the top view, left hand side of the drawing.

Soldering is not as hard a job as most model flyers believe, and if the reader has had no experience in this line he had better start doing so at once because the Compressed Air and Steam Motors coming later cannot be constructed without a good deal of careful soldering, and as the soldering of these bearings are easy, compared to the harder work to come, I would advise beginning now.

I would suggest the model maker procure an alcohol lamp (made for soldering) a can of soldering paste and some soft strip solder.

To solder two objects together, it is necessary to clean the parts thoroughly first, by scraping with a knife or file, applying some paste to the parts to be joined. Next take the alcohol lamp in the right hand and solder in the left, apply the point of the flame to object to be soldered, when sufficiently heated touch with solder and it will run into place, making a strong joint.

It is best to lay the object on a piece of wood, because if laid on metal it might become soldered together. To do good soldering it is only necessary to be careful not to burn the metal and not to use too much solder. It is surprising what good work can be done after a little practice.

When finished, fasten the bearings in place on the ends of the propeller hanger, as shown in sketch at left of drawing.

The wings are made much the same as the wings for the Tractor model, the only difference being instead of a spruce entering edge this one is of bamboo with a spruce spar through the center ¼" x ⅛".

The large wing is 24" long and 5" wide, the small one 12" x 3". When finished cover with china silk or paper and dope with a solution of celluloid dissolved in banana oil. This solution not alone shrinks the fabric but fills the pores as well.

The propellers are cut from a blank 12" long 1¼" wide and 1¼" high, as shown at the lower right hand of the drawing. This is the high pitch type and is cut as described in the instructions for propeller carving, as shown previously. When carving the propellers be careful to cut one to turn one way and the other to turn the reverse.

The motor consists of 16 strands of ⅛" flat rubber to each propeller.

To fly, set the main plane about 4" from the rear propeller spar and the elevator about 8" back of the apex of the frame, insert a small block of wood under the leading edge of the elevator to give it the required angle of incidence. Twist the propellers reverse way a few times to take the slack out of the rubber.

Hold the propellers and propeller spar with the right hand, place the left hand at a point under the elevator to balance.

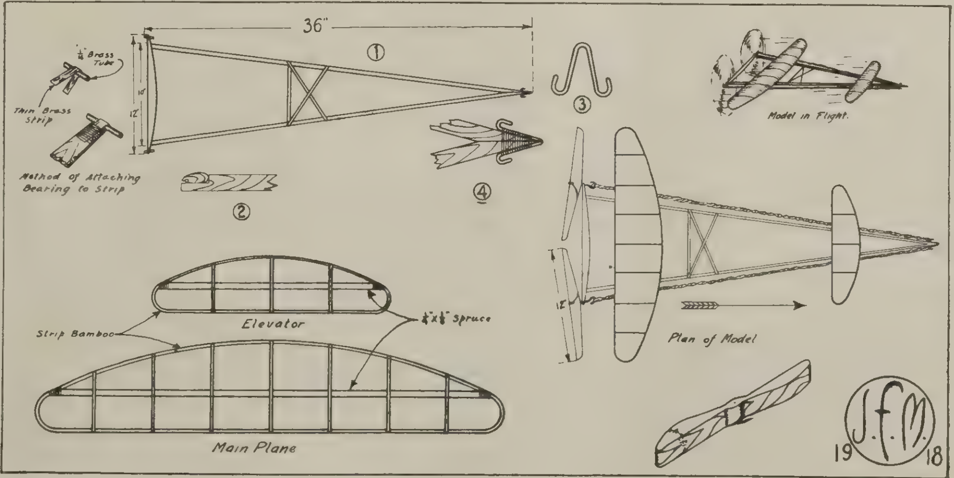
Now hold the model on a line with the shoulders and throw gently, as in launching the Tractor. (The push should be given with the right hand, the left is used to balance the model.)

After a few experimental flights shifting the wings back and forth, or placing a thicker or thinner block of wood under the elevator, the model flyers will discover the proper combination to get the maximum flight out of the model.

To wind the motors up it is necessary to have the assistance of another person to hold the model, because it is necessary to stretch the rubber at least twice the length of the machine to get the maximum revolutions out of the rubbers. A small hand drill is used by some model flyers for winding the rubber, while others use an egg beater cut down.

The egg beater is the better winder because it winds both rubbers at once on opposite directions and an even amount of revolutions. If the drill is used it is necessary to wind one rubber one way, counting at the same time, then wind the other the reverse way, counting again, so as not to have one wound tighter than the other.

(To be continued)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

This Actually Happened

A Joy-killer is a bird you take for a beginner. He goes up with you, and you give him an Immelman, coming out flat on your back. After that, some engine side-slips to vary the monotony. Then, when you come down, you look closely to see if the sport hasn't made him a little white around the gills. Far from it! He fishes out a cigar and calmly announces: "It has been a long time since I did any of that old stuff. I like to go up and ride upside down for twenty or thirty minutes, and wind up with a reverse loop!"

And We've Said it All Along

We know a way to stop this darn war in exactly one day. Here it is—give Bill Hohenzollern a thousand bombers and bombing pilots to talk to him and the Kronprinz for that length of time.

Where Ignorance Is Bliss

Realizing the grave danger in flying, a cadet's sweetheart wrote him last week to "be careful for her sake and in the future to fly low and slow," thereby making the training less hazardous.—Plane News.

Every Move a Picture

Monitor: "Your 'take off' was very wobbly."

Cadet: "Yes, I was 'taking off' Charlie Chaplin."—Plane News.

Ye Editor-Aviator

Contrib. (scratching his head): "Anybody know anything good for 'Tale Spins'?"

Lieutenant Baker (automatically): "Yeah. Put your controls in neutral."

Goin' Up

Negro (to recruiting officer): "Boss, whar do de Infan'ry all fight?"

Recruiting officer: "The Infantry fights in the trenches."

Negro: "And whar do de artillery fight?"

Recruiting officer: "The artillery fights from behind the trenches."

Negro: "Well, then, boss, whar do de aviashon fight?"

R. officer: "The aviation fights in the air."

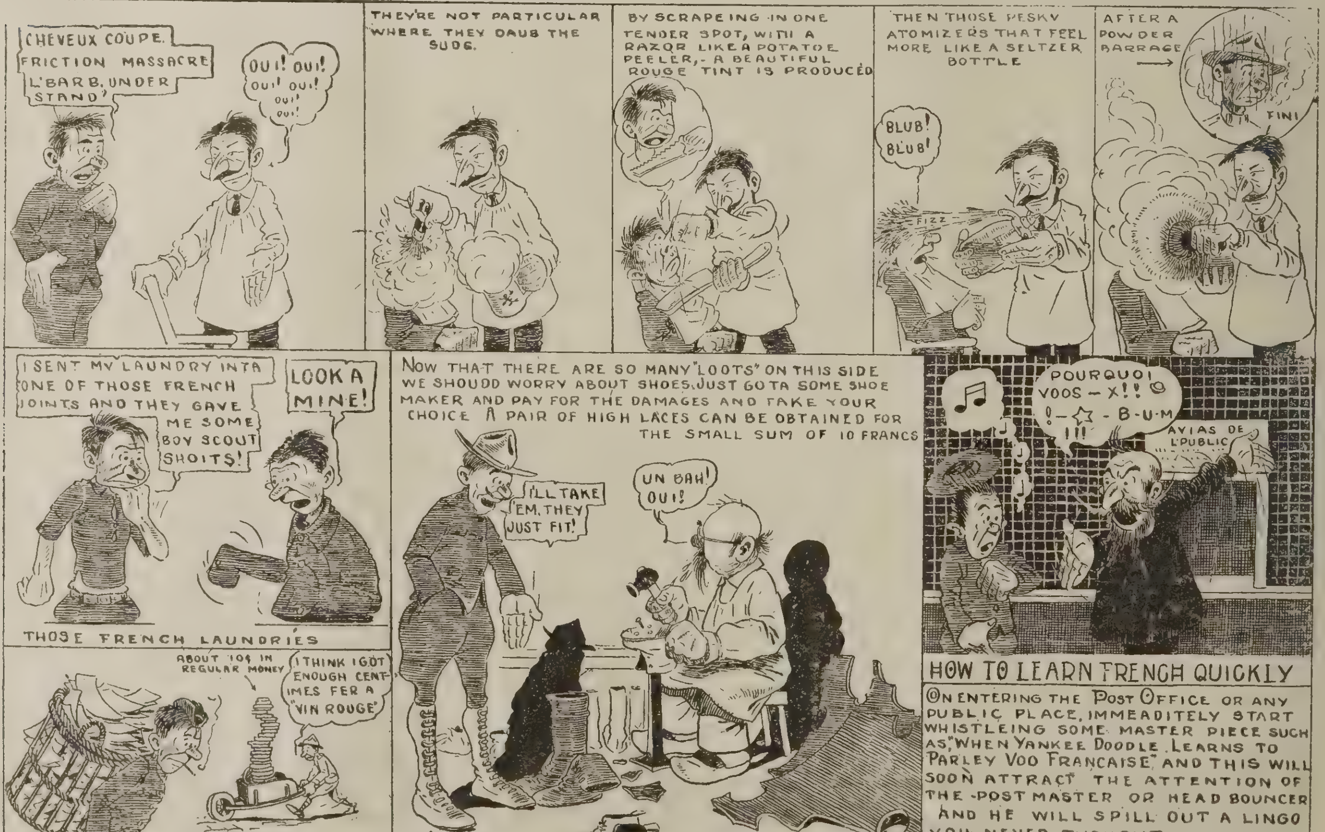
Negro: "Well, den, boss, dat's what I done want to jine."

R. officer: "And why do you prefer the aviation?"

Negro: "Well, sah, I already done told my wife that ah wus gwine to be de man highah up."

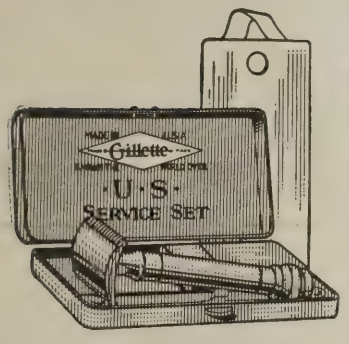
OUI! THIS IS FRANCE

By "Alex"

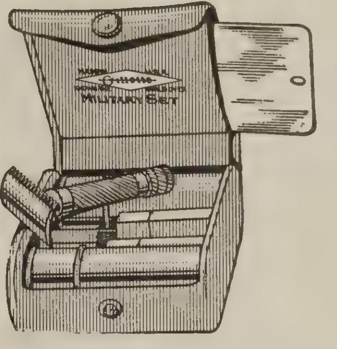

CHEVEUX COUPE. FRICTION MASSACRE L'BARB. UNDER STAND?
OUI! OUI! OUI! OUI! OUI! OUI!
THEY'RE NOT PARTICULAR WHERE THEY DAUB THE SUDS.
BY SCRAPEING IN ONE TENDER SPOT, WITH A RAZOR LIKE A POTATOE PEELER,- A BEAUTIFUL ROUGE TINT IS PRODUCED
THEN THOSE PESKY ATOMIZERS THAT FEEL MORE LIKE A SELTZER BOTTLE
BLUB! BLUB!
FIZZ
AFTER A POWDER BARRAGE →
FINI
I SENT MY LAUNDRY INTA ONE OF THOSE FRENCH JOINTS AND THEY GAVE ME SOME BOY SCOUT SHOITS!
LOOK A MINE!
THOSE FRENCH LAUNDRIES
NOW THAT THERE ARE SO MANY "LOOTS" ON THIS SIDE WE SHOUDD WORRY ABOUT SHOES. JUST GO TA SOME SHOE MAKER AND PAY FOR THE DAMAGES AND TAKE YOUR CHOICE A PAIR OF HIGH LACES CAN BE OBTAINED FOR THE SMALL SUM OF 10 FRANCS
I'LL TAKE 'EM, THEY JUST FIT!
UN BAH! OUI!
POURQUOI VOOS — X!! @ !—☆ - B-U-M !!!
AVIAS DE L'PUBLIC
HOW TO LEARN FRENCH QUICKLY
ON ENTERING THE POST OFFICE OR ANY PUBLIC PLACE, IMMEADITELY START WHISTLEING SOME MASTER PIECE SUCH AS, "WHEN YANKEE DOODLE LEARNS TO PARLEY VOO FRANCAISE" AND THIS WILL SOON ATTRACT THE ATTENTION OF THE POST MASTER OR HEAD BOUNCER AND HE WILL SPILL OUT A LINGO YOU NEVER THOUGHT WAS PART OF THE FRENCH LANGUAGE AND YOU WILL AT ONCE UNDERSTAND WHAT HIS FIGURES OF SPEECH ARE INTENDED FOR.
ABOUT 10¢ IN REGULAR MONEY
I THINK I GOT ENOUGH CENTIMES FER A "VIN ROUGE"
ANY WASTE BASKET COULD BE UTILIZED IN THIS MANNER FOR PACKING OUR FRANCS.
ALEX AIR SERVICE A.E.F FRANCE.

Courtesy "Plane News"

Gillette SAFETY RAZOR



The New U. S. Service Set.—A solid metal case, heavy nickel-plated and embossed with the insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box, indestructible Trench Mirror inside the lid . . . $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges) $7

Even when there isn't much time or room for a shave, the Gillette makes shaving a comfort

The thousands of Gillette users in the Service, everywhere—on land or sea—would use the Gillette even if the Regulations didn't specify a clean shave. Braces them up, and gives such a clean feeling. It gets any man on his tip-toes to feel his beard slip off under the Gillette—his face free of dust and grime, cool and fresh. The Gillette makes shaving a joy—not a job.

Have you seen the new Gillette sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service—men who know what the fighting man is up against

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready.

No Stropping—No Honing When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen or Y. M. C. A. Hut, here in America or overseas.

Our Paris office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

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of Canada, Ltd.
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Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in—that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn*.

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

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200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·

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WE CAN ALSO ARRANGE FOR ASSOCIATE GROUP FABRICATION
WOOD RIBS, STRUTS AND PARTS

SEAPLANE DEVICES FOR LANDING ON COMMERCE SHIPS

JANNEY-STEINMETZ CO., PHILADELPHIA

(*Continued from page* 781)

connection with the lateral dihedral principle. Apart from these preceding considerations of height of the centre of gravity, there is another important factor apt to be disregarded. *If the masses of an aeroplane are so distributed that the machine has a virtual axis of inertia inclined downard and forward, the lateral dihedral principle becomes unstable and the negative dihedral or Vee opening earthward becomes stable.* This theory has only been previously put forward on one occasion, and then it was so formulated as to appeal to designers to adopt this crude weight distribution in conjunction with the negative lateral dihedral. But as an aviator the writer prefers to see the positive dihedral correctly applied and to warn the designer against the weight distribution, which will render the dihedral unstable if he adopts it. More accidents are likely to be prevented by taking this course than by advocating the other rare principle.

The explanation, of course, is very simple. Consider a marine aeroplane (Britishers are finding that marine aeroplane is better than a multiplicity of alternatives, such as seaplane, waterplane, etc.) in which there is a heavy seaworthy boat low and in front, planes staggered back with probably a fuselage in between, and lastly a heavy engine on top of the rear top plane. This machine has its inert masses on a line running downward and forward from the centre of gravity of the engine. Give this aeroplane a lateral dihedral angle. If the pressure on the near wing is augmented by a gust or change in the relative wind rotation occurs about this *inclined* axis. Thus the near wing, instead of going out of the gust, comes more and more into prominence. The system is unstable. As an aviator, of course, the writer is not too well acquainted with the methods of designers of high class aeroplanes, but he hopes they will find the points raised worthy of their consideration.

(*Continued from page* 778)

out of their brains will come, I believe, hundreds of improvements that will make the aeroplanes of tomorrow equally radical in their epoch-making possibilities.

We will win this war; why? Because it is a war of democracy against autocracy, a war of mental freedom against mental domination, a war of right against wrong.

Right will conquer, it always has and it always will. Humanly speaking, this war is a mechanical war, a war to be waged and won with machines directed from the air. It is a war that our *red*-blooded young men, in whose hearts have been kindled the *white* heat of true patriotism, flying in the *blue* sky of an ever-increasing democratic world, will, with the help of almighty God, fight to a glorious and victorious end.

After Altitude Record

Hampered by unsatisfactory weather conditions, Lieut. Culver, of the aerial mail service, arrived at Belmont Park soon before three o'clock on June 10, after a slow flight from Philadelphia. He brought with him five pouches containing 130 pounds of mail.

Lieut. Culver reported that on his trip to Philadelphia on Saturday, he had tried for an altitude record, hoping to reach 20,000 feet in the fine weather he at that time encountered. He reached a height of nearly 18,000 feet but found it so cold that he decided to put off the test until his next Philadelphia bound trip, when he will make special preparation to withstand the altitude temperatures.

Becomes Bride of Aviator

In St. Agnes' Church, at Hoyt and Sackett streets, Brooklyn, last Wednesday, Miss Marie Agnes McCormack, daughter of Mrs. Elizabeth McCormack, of No. 340 Union street, Brooklyn, became the bride of Lieut. Vincent J. Coletti, at present attached to the Aviation Corps at Park Field, Memphis, Tenn. The Rev. James D. Duffy officiated.

Aeroplane Carries Cargo

French aviators in a seaplane carrying 660 pounds of cargo flew from Paris to London in two hours and three-quarters and back again in less time. With the development of aviation on the practical side, there may be no need of that long-mooted tunnel between England and the Continent.

To Speed Up Aero Mail

Paris, June 9.—A midnight air-raid party in a Paris hotel cellar was entertained by reading home news in *The New York Times* twelve days ago, which one of the group had just received in the American mail. Special interest was shown in the cellar in the news about the aero mail service between Washington and New York. The listeners wanted to know why time was lost by the mail planes landing on Long Island.

"Why," asked a woman in a bathrobe, sitting on a barrel, "can't they build a big platform on the roof of the New York City Post Office, and let the planes fly low enough to drop pouches on a platform?"

Superintendent of Mails E. M. Norris said in regard to the above dispatch that it was entirely feasible for aeroplane mail to be dropped on the roof of the New York Post Office, provided the high buildings of the city would permit the aeroplanes to fly sufficiently low, but that mail could not be picked up by machines starting to Washington.

"Some time ago," he said, "representatives from two aeroplane factories measured the roof of the Post Office and said it was practicable for aeroplanes to start and alight there. They wanted a fifty-thousand-dollar apparatus built. If aeroplanes could start directly from the Post Office and alight there, about an hour could be saved in each direction between New York and Washington."

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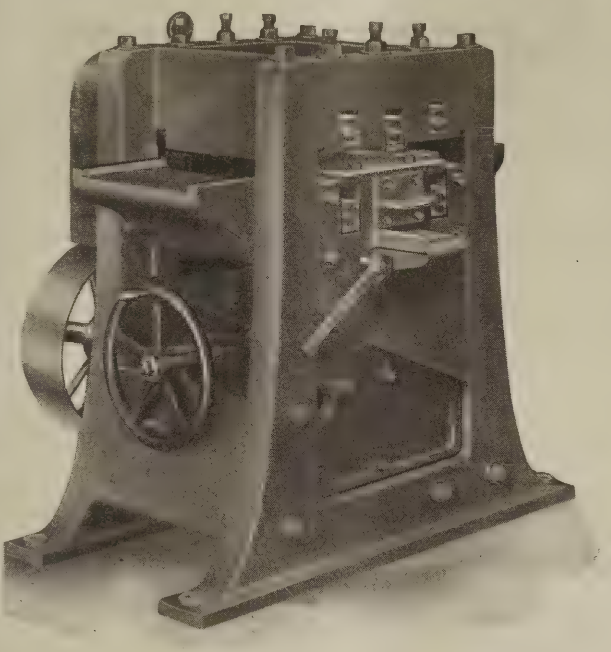

Whitney Scraping and Toothing Machine

(Continued from page 785)

Rabenstein, Maurel K.	FRF
Reichardt, Chris	FRF
Rose, Joseph E.	FRF
Reed, Carroll C.	FRF
Reeve, Jay F.	FRF
Rechsteiner, Victor Martin	SLR; RSD
Robinson, Edward Heaword	FLR; DAP
Ransom, Harold Browne	SLR; KST
Reeve, Jay Frederick	SLR; RWT
Rue, Lars	DIK
Regan, Harold J.	DIK
Reilly, Francis Thornton	SLR; Note 5

S

Smith, Ernest L.	SLR; AAD
Smith, Harold Arthur	SLR; KST
Smith, Clarence B., Jr.	TFT
Smith, Fred H.	TFT
Schanck, Rollin N.	TFT
Silcott, Arthur E.	TFT
Sloan, Clarence B.	TFT
Sullivan, Henry B.	TFT
Stine, Harold Blaine	SLR; ELA
Sullivan, Charles Wesley	SLR; RSD
Slattery, Thomas A.	MAC
Shober, John B.	WDM
Swaller, Sidney R.	DIK
Spilmah, Louis	SLR; RSD
Schwartz, Charles William	SLR; RSD
Siner, Louis Harry	SLR; RSD
Stites, James Walker	SLR; KST
Small, Sydney F.	DMA
Spencer, Vernon W.	FRF; DIK
Shirley, Walter H.	TMA
Sauls, Jesse W.	PFO
Shillington, Waldo E.	PFO
Snarenberger, [illegible]	SLR; PMT
Spinning, Fred [illegible]	SLR; RWT
Sweeney, Edw[illegible]	SLR; EOT
Shaw, William [illegible]	SLR; ELA
Schlemmer, N[illegible] Charles	SLR; KST
Scott, James Hardin	SLR; RSD
Shine, Ira James	SLR; KST
Sloniger, Eyir L.	SLR; KST
Stedman, Livingston Boyd, Jr.	SLR; KST
Schuck, Harold Belzer	SLR; CWT
Spencer, William Warren	SLR; MDO
Spivery, Lloyd G.	DIK
Stetson, Phillip C.	DIK
Sherman, John K.	FRF
Sharon, William F.	TFT
Stratton, Frank A.	HHN
Stout, Sydney Allerdice	SLR; RSD
Stockman, Otto J.	LHV
Stone, Percy N.	SLR; FRF; PMT
Scott, Townsend, Jr.	FRF
Sampter, Herbert C.	CWT
Shepherd, Floyd W.	CWT
Shay, Carleton C.	DIK
Stanley, John M.	TFT
Sweeley, Lester J.	TFT
Stout, Samuel C.	DIK
Suthers, William J.	DIK
Senft, Walter M.	DIK
Symonds, Merrill E.	SLR; EOT
Shannon, Arthur James	SLR; LDT
Sullivan, William Simmons	SLR; AAD
Stewart, Robert H., Jr.	FRF
Slocum, Paul F.	DMA
Squier, Carl B.	SMM
Slade, William	SMM
Snyder, Robert Y.	CFT
Steinhauer, Louis Edward	SLR; EOT
Stezler, Harry G.	FRF; DIK
Sherwood, Lyman Wetmore	SLR; KST
Symons, Thomas William, Jr.	SLR; RSD
Simpson, George Logan, Jr.	SLR; CWT
Swift, Charles Patrick	SLR; TFT
Schmidt, Edgar August	SLR; CWT
Stephens, Russell Stout	SLR; LDT
Savage, Clair R.	FRF
Sullivan, Edward B.	FRF
Stukey, David C.	FRF
Sullivan, Joseph I.	CAF
Slater, Harry E.	SMM
Stevenson, Frederick D.	LDT
Swallow, Sidney R.	FRF
Scheetz, Jack F.	FRF
Senft, Walter M.	FRF
Swift, Charles P.	FRF
Saunders, Minott F.	SMM
Scott, Neal J.	DIK
Steele, Albert S. J.	SMM
Schram, Herman	DIK
Stalker, Willard C.	DIK
Schlatter, Donald W.	SMM
Smith, George Milan	SLR; RSD
Smith, Vincent K.	LHV
Smith, Carl M.	FRF
Smith, Landis S.	SMM
Smith, Glenn E.	SMM
Safford, Loyal Robinson	SLR
Spafford, Louis Harold	SLR
Stalker, Williard Clem	SLR
Spang, Joseph Peter, Jr.	SLR; FOB
Shearer, David Robert	FLR; DAP
Stanley, Lyman Roberts	FLR; DAP
Spencer, Bonifield Melville	SLR; RSD
Smith, Wesley Leland	SLR; RSD
Smith, Glanton	SLR; Note 5
Stansell, Arthur Dickey	SLR; DAP
Snyder, Gerald Seemuth	SLR; KST
Spellman, Sterling Bartholomew	SLR; RSD
Stone, George Eathl	SLR; SRC
Simmons, Joseph Irving	SLR; Note 9
Spear, Holden	DAP
Stephenson, Arthur Warren	SLR; RSD
Spencer, Henry Wesley	SLR; EOT

T

Twining, Albert Chester	SLR; PMT
Taylor, Frederic Halsey	SLR; KST
Thomas, William Albert	SLR; CRI
Thomas, Newell E.	SAG
Tupper, William Stewart	SLR; VBW
Turner, Lambert	SLR; CWT
Tynes, William Fisher	SLR; EOT
Tansley, Thomas L.	TFT
Taylor, Harold L.	TFT
Thiel, William A.	TFT
Tierny, John W.	TFT
Tinnerholm, Robert F.	TFT
Tobey, Paul T.	CWT
Tupper, Preston E.	CWT
Tyres, John W.	DIK
Teeter, Charles	DIK; FRF
Tolles, Raymond P.	PFO
Tillinghast, Harold A.	AAD
Taylor, Leonard D.	FRF; SLR; AAD
Tussing, Earl R.	DIK
Tyler, Lee	DIK
Trowbridge, James Orr	SLR; EOT
Tillisch, William Henry	SLR; KST
Tomlinson, Kenneth C.	SLR; RSD
Tucker, Ernest A.	SLR; FRF
Torney, Stewart W.	TFT
Tompkins, John L.	TFT
Thompson, Howard C.	SLR; VBW
Thigpen, Roy Miller	SLR; KST
Tower, Roderick	HHN
Tyler, Bernard Otto	SLR; EOT
Thomas, Charles E.	FRF
Taylor, George deB.	FRF
Thayer, Alexander D.	SMM
Thomson, Henry	SLR; RSD
Tanner, Herbert J.	FRF
Trueheart, James O.	DIK
Tefft, Lionel V.	FRF
Turner, Robert W.	SMM
Turrill, Gardner Stilson	SLR
Tynes, William F.	TFT
Templeton, Raymond E.	SMM
Terrell, Lasater	SMM
Thomson, Robert Richardson	SLR; DAP
Thayer, Raymond Harold	SLR; KST
Thompson, John Faville	SLR; RSD
Thomas, William G.	FRF
Tracy, Ray Perry	SLR; KST

(Continued on page 796)

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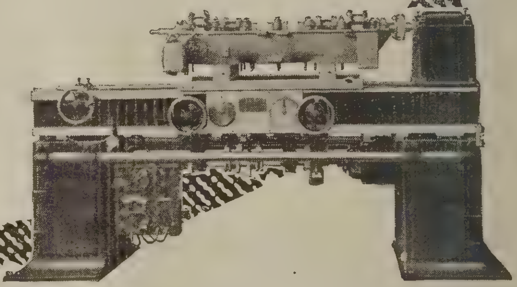

(Continued from page 793)

V

Verkrouteren, John Henry	SLR; EOT
Vance, Earl T.	FRF
Vaden, Ferris E.	DIK
Vessey, Burton Floyd	SLR; KST
Vinton, Benjamin	CWT
Veblen, Elling H.	FRF
Van Horn, John Willis	SLR; KST
Vandermeer, Dirk J.	SLR; TFT
Van Capen, William	FRF
Voorhees, Garret Samuel	SLR; EOT
Vosburg, Burray S.	MAT
Vaden, Ferris Edgar	SLR; RWT
Van Kirk, Russell Morris	SLR; CWT
Van Valin, Oliver Jay	FRF
Vernon, Fred	SMM
Vickery, Merritt A.	FRF
Van Buren, Henry M.	PFO
Von Bokern, Frank	RTR

W

Willson, Ray Duff	DIK
Wheeler, Oliver Percival	SLR; RSD
Wilbur, Fred V.	SLR; FRF; PMT
Whiteside, Robert B.	FRF
Weymouth, Frank William	SLR; RWT
Walrath, Duane Everett	SLR; KST
Williams, William P.	SLR; MAC
Whitbeck, Robert R.	MAC
Waldrom, Ralph E.	PFO
Watson, Vernon A.	PFO
Wiegman, John P.	PFO
White, Lloyd K.	SLR; FRF; LDT
Wright, Putney L.	TFT
Wright, Stanley V.	TFT
Wardell, Charles H., Jr.	CWT
Whitten, Lacey R.	CWT
Woods, Roy J.	DIK
Woodman, Cony U.	MAC
Wilkinson, James L.	DIK
Wilbur, Fred V.	DIK
Welch, Peter W.	DIK
Welsh, Horace Oliver	SLR; CJW
Wylie, John	SLR; RSD
Winch, George Arthur	SLR; RWT
Webb, Sigel Goodwin	SLR; RSD
Wieslander, Leslie Rudolph	SLR; RSD
Whitsitt, Vincent P.	EOT
Welsh, William W.	SLR; FRF; AAD
Williams, Luther Bozeman	SLR; KST
Wilkinson, James L.	SLR; FRF; PMT
Warde, Arthur F.	DIK
White, Harwood Arend	SLR; TFT
Wallace, Vester M.	BST
Williamson, Cleburne M.	SLR; DIK
Wheeler, Franklin C.	FRF
White, Harwood A.	FRF
Whitten, Lyman P.	FRF
Westbrook, Virgil Darst	FRF
White, Harold A.	FRF
Wilkins, Alfred E.	FRF
Willett, Albert B.	FRF
Winch, George A.	FRF
Wright, Joseph H.	FRF
Wilkinson, William T.	FRF
Whitney, Cornelius V.	FRF
Welsh, Horace O.	FRF
Wilkes, Preston Brooks	SLR; CSO
Worrell, Willard Parker	SLR
West, Norman Stewart	SLR
Wiley, Edmond Fenton	SLR
Wardwell, Chester Theodore	SLR; CJW; FRF
Wing, Charles Rufus	SLR; RWT
Willard, Alfred J.	DIS
White, Kenneth T.	FRF
Woodies, Arthur F.	FRF
Wood, Joseph, Jr.	DMA
Wood, Edward H.	SMM
Warfield, Richard E.	MAC
Watson, Edward B., Jr.	FRF
Walker, Howe	FRF
Wallace, Edward S.	FRF
Warren, Kenneth C.	FRF
Watson, Charles F.	FRF
Whittemore, Harris, Jr.	FRF
Woodleton, Royal B.	SMM
Wright, Arthur W.	CFT
Westall, William H.	DIK
Wright, Joseph Hazazer	SLR; RWT
Walker, Walter Treat	DAP
Wolf, John Elmer	SLR; RSD
Wootten, Richard Kelly	FLR
Williams, Paul Klostar	SLR; KST
Woolsey, William W.	DAP
Wilkeson, Livingston Evans	SLR; RSD
Witbeck, Robert Raymond	SLR; RSD
Walker, Ralph Glade	SLR; RWT
Wright, William Milton	SLR; RSD
West, Harry G.	DAP
Wells, Harold Raymond	DAP

Y

Young, George Edward	SLR; RSD
Young, Wallace S.	SMM
Yager, Frank R.	FRF
Yocum, Reuben John	SLR; KST

Z

Zimmerman, Earl Henry	SLR; RSD
Ziegler, John W.	FRF
Zeisenheim, Joseph R.	FRF

(Continued from page 760)

In October, 1916, a site was selected for the committee's proposed laboratories, 4 miles north of Hampton, Va., and the selection was approved by the War Department, which purchased the site. A contract has been entered into for the erection of the first building, at an estimated cost of $80,900. The building is now in course of erection. The committee has also under preparation plans for the first aerodynamic laboratory, to be installed at Langley Field, intended for the development of high wind speeds.

Early in 1917 the committee took up the question of insurance for aviators, and recommended the advisability of undertaking at an early date the insurance of aviators, or some form of financial co-operation with the insurance companies that would enable them to write insurance at rates possible to the insured.

Investigate Use of Steel for Planes

The committee has now in hand (November, 1917) a most important investigation on the use of steel for aeroplane construction, and is supervising the development of a design for construction of steel, to be later subjected to a program of tests, intended to show the possibilities of this construction. In connection with material tests, the committee has given attention chiefly to an investigation of strut forms for aeroplanes, the strength of spruce bars, and the development of cotton aeroplane fabrics as a substitute for Irish linen. In the field of power plant design, the committee co-operated with the Bureau of Standards in the design, construction, equipment and operation of a large low-pressure chamber in the testing laboratories, which is intended to reproduce the conditions of aircraft engines operating at high altitudes. This work was especially done in connection with the development of the Liberty engine. Researches were also carried out on the oubjects of radiator design, carbureter design and adjustment, ignition aparatus, etc. One of the members of the committee's technical staff supervised the tests on the first Liberty engine at Detroit, Pike's Peak and elsewhere, to determine the mechanical and thermal efficiencies and its power delivery at various altitudes.

Important investigations have been made in connection with various instruments used on aircraft, and in particular there has been developed an improved form of geographic position indicator. The committee has co-operated in the development of a generator for wireless transmission from aeroplanes, intended to satisfy the

(Continued on page 798)

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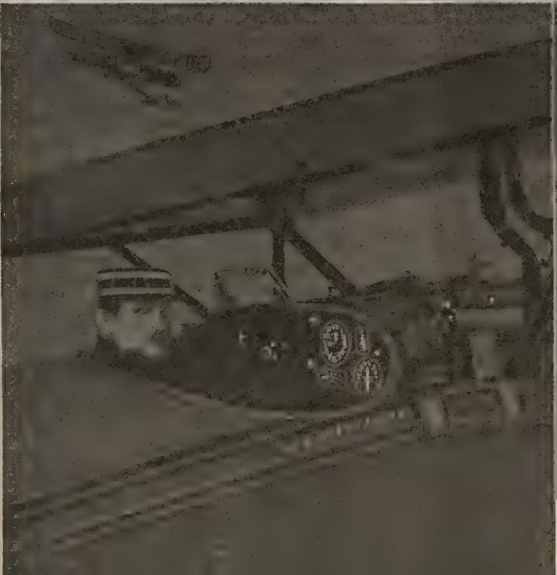

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(*Continued from page 796*)

requirements of the Army and Navy. Methods of receiving wireless signals in an aeroplane have also been investigated, and it has been established at several receiving stations that the sound method is practical.

Under the auspices of the committee, gratifying progress has been made in the development of a new type of aeroplane mapping camera. Before regular navigation of the air can be undertaken, it will be necessary to supply maps and to establish suitable and marked aerial routes and suitable landing places for the aviator. In certain sections of the country, and through the general co-operation of patriotic citizens interested in this work, gratifying progress has been made in these directions, notably between Dayton, Ohio, and Rantoul, Ill.

At the recommendation of the committee, an appropriation of $100,000 was made by Congress for the extension of aerological work of the U. S. Weather Bureau.

The committee has also acted as a board of inventions for the Government, in matters relating to aeronautics, and since the outbreak of hostilities has weekly examined hundreds of suggestions and inventions. Several suggestions of value have been received and brought promptly to the attention of the particular Government office most directly interested. Further attention has been given during the year to the subject of the definition and examination of technical terms used in aeronautics, and a further edition of the bulletin on the subject of nomenclature has been prepared.

On recommendation of the Advisory Committee, in December, 1916, the War, Treasury, Interior and Commerce departments adopted the metric system of weights and measures for all drawings and calculations on aeronautical matters, for use with their accompanying English equivalents. However, owing to war exigencies, the system has not been generally used by the War Department. Some work has been done in connection with the problems of aerial mail service and civil aerial transport.

For the accommodation of transient aviators in Washington, the committee co-operated with the War Department in the selection of a tract of land on the eastern branch of the Potomac River, southeast of the Washington Navy Yard.

In November, 1917, members of the Advisory Committee, in two different groups, made trips of inspection to three important centers of aeroplane production, namely, Dayton, Ohio; Detroit, Mich., and Buffalo, N. Y. The object of these trips was to place the committee in immediate contact with conditions in the industrial field and to give them an apportunity of forming a personal, first-hand judgment regarding the productive capacity for aeroplanes and aeronautic engines at that date. The members were very favorably impressed with the serious energy and purpose with which the manufacturers were approaching the problem of quantity production, and with the productive capacity now rapidly approaching the point of effective service.

Eleven technical papers are included with the report, as follows, Meteorology and Aeronautics, by Prof. William R. Blair; Experimental Research on Air Propellers, by Dr. William S. Durand; Nomenclature for Aeronautics, by Dr. Joseph S. Ames; Stretching of the Fabric and Deformation of the Full Balloon, a translation from the German, by Prof. Karl Darrow; An Investigation of the Elements Which Contribute to Statical and Dynamical Stability and of the Effect of Variations in Those Elements, by Prof. Alex. Klemin; Aerofoils and Aerofoil Structural Combinations, By Major H. S. Martin, S. C., and Major E. S. Gorrel, S. C.; Periodic Stresses in Gyroscopic Bodies with Application to Air Screws, by Dr. A. F. Zahm; Aerodynamic Coefficients and Transformation Tables, by Dr. Joseph S. Ames; Theory of an Aeroplane and Housing Gusts, II, by Prof. E. B. Wilson; Fabrics for Aeronautic Construction, by E. D. Whalen; Aeronautic Power Plant Investigation, by Dr. H. C. Dickinson.

Future Travel and Mails by Air

The future of aeronautics in commerce was discussed by Mr. G. Holt Thomas, managing director of the Aircraft Co., Ltd., in an address at the Savoy Hotel to the American Luncheon Club. The recent advance on the part of the Germans, he said, could not have taken place if we had had enough aeroplanes. The Germans had started a service between Berlin and Constantinople. It was said that the aeroplane was not a commercial proposition because it could not carry a motor car. It could carry weights greater than a motor car. The claims for commercial, or uncommercial, aeronautics were: (1) It was faster than any other form of transport; (2) it was quite reliable enough to-day, and would get much more reliable as engines improved; and (3) it was not too costly to make it a commercial proposition. From London to Berlin the fastest route was 20½ hours; by aeroplane it was 7½ hours. To Constantinople the fastest route was 72 hours, but with an aeroplane travelling only 80 miles an hour they could get there in 20 hours. Petrograd was 50 hours away by the fastest route, and an aeroplane would take only 18 hours. There was no place on earth farther than five days from London at 80 miles an hour. He did not suggest that one machine would fly from London to Melbourne, but routes could be established. We had to look upon a commercial system of aeroplanes as a series of stages, with changing machines and pilots. Melbourne was five days from London at 80 miles an hour, Tokio, 4½ days; New York two days by the longest route, via the Azores, Buenos Aires, 2½ days; Ceylon, 2¾ days; and Cape Town, three days. Taking the cost of running an aeroplane with two engines and carrying a good load at 5s. per mile between London and Paris, the cost of the carrying of mails worked out at one-third of a penny per ounce. and if they charged a halfpenny an ounce they would make a good profit. They could carry passengers to Paris at £5 a head, to Marseilles at £10 per head, and to Constantinople at £25. He was talking about full loads all the time. The post to Paris would, of course, be a special service at a special rate.

Lieutenant Baer, Ace, is Prisoner

Fort Wayne, Ind.—Lieutenant Paul Frank Baer, the American "ace," who has been reported missing since May 22, is a prisoner in a German camp, according to confirmatory telegrams received.

U. S. Flier Captured

Paris.—Lieut. R. W. Parker, an American pilot in the French Flying Corps, was forced to land while acting as a scout on a bombing expedition over Germany.

He was taken prisoner by the Germans.

More Planes Wanted

An Atlantic Port.—"Send us 20,000 aeroplanes and aviators enough and we will win the war. We have plenty of men, and the French can hold the enemy in France if America will only provide the aeroplanes."

Such was the plea of J. V. Davy, of the French Ministry of Agriculture, who arrived at this port on a big French trans-Atlantic liner.

Frederick H. Prince, a brother of Norman Prince, who was killed in France, also spoke of the need of more force in the air for the Allies on the Western front.

"Everything is fine over in France now," he said, "but they need aeroplanes and aviators, plenty of them. They are an absolute necessity, and they must get over there quickly."

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WEEKLY

Vol. 7, No. 17 JULY 8, 1918 10 CENTS A COPY

Italian airmen protecting the city of Venice from air attack. (Italian Official Photo)

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OFFER 10,000 PLANES TO FLY TO FRANCE

W. H. WORKMAN, the American manager for the Handley Page Company, has announced that he had laid before the War Department, the Aircraft Board, and the Department of Military Aeronautics a plan to build 10,000 bombing machines in this country and fly them over to France by the Spring of next year. Mr. Workman, who accepted the proposal of the Aero Club of America to make a single flight, said that the plan to fly big American planes to Europe was not only feasible, but was a practical and sure way to deliver the machines without requiring so much shipping as to cripple the transport of troops and other supplies.

The wear-and-tear on the machines by the flight, said Mr. Workman, and the possible loss of machines en route, would probably come to a smaller total than the loss of aeroplanes by the sinking of freight ships by submarines, if they were sent in cargo boats. He asserted that the plan could be carried out with little or no loss of life by aviators flying the machines, whereas their delivery and use in France early next year would be sure to save thousands of American soldiers. According to Mr. Workman, 10,000 big American bombing planes in France next year would win the war.

Mr. Workman proposed that the aeroplanes should fly across the Atlantic with a full crew and complete load of bombs and other equipment. His plan would have the first lap of the flight from the aeroplane factory to Newfoundland, the second to the Azores, the third to Portugal, and the fourth to France. While great construction work and organization would be required at Newfoundland and at the Azores, Mr. Workman asserted that this part of the program was no insuperable obstacle.

He was quite certain that the flier, aided by wireless instruments, able to detect the distance of wireless waves from stations on the Azores and elsewhere, which would be practically lighthouses for aerial navigation, would be in no danger of getting lost or losing much time through flying off his course. Mr. Workman chose the Azores route, he explained, not only because it broke the flight into two sections, allowing the aviator to rest, sleep, and tune up his machine, but also because the atmosphere was normally clearer by the southern route than it would be in a direct flight across to Ireland. The Azores has a volcano 7,000 feet high, visible at fifty-six miles from the deck of a ship and at a greater distance from an aeroplane, which would also simplify the trip. The longest single flight would be one of 1,250 miles from St. John's to the Azores. From the Azores to Portugal is 700 miles.

"These 10,000 aeroplanes would be sufficient to drop 38,000 tons of explosives every night on German lines of communication, bridges, ammunition dumps and plants, and fortified places. To grasp what this means, it is equal to 38,000 of the largest shells fired by the biggest guns yet constructed, the 16-inch coast defense guns. But, while the extreme trajectory of such a gun carries a shell weighing about one ton about thirty miles, the Handley Page aerial dreadnought will easily carry from Paris to Berlin several times the destructive power of one such shell, and do it nightly, week in and week out. And at the end of thirty or sixty days, if there were anything left of the Germans, they would cry for peace. While doing all this each machine, with the strong armament which it will carry, will be able to defend itself against all attacks made upon it by enemy aircraft.

"This is a gigantic undertaking, but it means that the country must get behind it and accomplish it. When the Administration at Washington wants to sell five billions of Liberty bonds the nation gets behind it. When the War Department makes up its mind to put a million troops into France by July 1 the nation and the shipping get behind that. It will therefore be necessary for the nation to get behind a program of this kind in the same manner, and then we cannot fail."

After replying to various objections which have been advanced against trans-Atlantic flights, Mr. Workman continued:

"Now supposing that it should not be considered altogether possible to fly the 1,250 miles from Newfoundland to the Azores in perfect safety. England recently sank several obsolete cruisers at Ostend. In the British and American Navies there surely must be at least ten destroyers in a state of obsolescence which could be stretched out across the 1,250 miles between December 1 and May 1, to act as lightships, and the pilots of the aeroplanes would never be out of sight of a destroyer. With this aid, together with their compasses and wireless, I cannot see why a single machine need be lost, unless on account of engine failure. This will not happen to all the four engines with which the aerial dreadnoughts are equipped and the flight could be continued with two or three engines to the Azores or, if not, to the nearest destroyer and the pilots and men be rescued.

Handley Page to Come Here

"It may be contended that this program will call for too great an expenditure. During the last year this country has spent or contracted to spend one billion dollars, and contemplates spending that much more this coming year, on aeroplanes. It is now generally understood that the American aeroplane program adopted by the Production Board last year has proved a costly and unsuccessful experiment. It is useless to cry about our spilled milk, but we must realize why it failed and set about the task of recouping ourselves with vigor, resolution, and understanding. The Production Board consisted largely of men who had met with considerable success in businesses wholly different from the scientific production of aeroplanes, and through lack of personal technical knowledge and misadventures, with the advice they chose to accept, they placed the Government in a position of embarrassment from which it is now seeking the best means of avoiding a repetition."

Mr. Workman advised the War Department that Mr. Handley Page, the designer of the bombing machine which bears his name, was ready to come to this country with a staff of experts to start the production properly if the plan were adopted. By building a well-tried type and separating experiment from production, our aeroplane production, according to Mr. Workman, "can be changed from a matter of biting chagrin to the credit and glory of the country."

"The question of engines arises," he continued. "I believe that if the Liberty motor would make such a trip that it certainly would dispel all doubts and criticisms and prove its real worth. A geared Liberty motor, however, will be necessary. If the Liberty motor cannot do it, then the country should know it and stop making them. If they cannot fly across the Atlantic they will never be able to do the work which is over there to be done in long-distance bombing, and in its stead we should be producing Rolls-Royce, Sampson, Sunbeam, and Bardmore engines, which, despite all statements to the contrary, can be produced in this country in sufficient quantity.

"As to the arguments put forth about the wear and tear on the engines, the total wear from Michigan to France would not exceed forty hours. Any aeroplane motor must run almost this long before it is what is termed 'run in,' but suppose it did wear them to this extent. They should be, according to foreign practice and experience, still good for at least another hundred or more hours' service before they would have to be taken down and gone over. Ten thousand bombing aeroplanes each equipped with four motors, on the western front by May 1 of next year, having had forty hours wear, will be better than having 10,000 aeroplanes congested in Eastern ports, but without any wear and being held up for ships to take them to France. Each aeroplane would still be able to do two or three weeks' continual service, and altogether they would drop close on to 1,000,000 tons of explosives on the German Army and all over Germany, which would cut a large hole in the German defense and the German morale, and probably finish the war then and there.

Effect Upon the Germans

"Now let us consider the morale of the Germans. They will naturally think that if we are flying across the Atlantic with thousands of these machines they can expect some real aerial fireworks within a very short time thereafter. The training the pilots will receive in observation work and long-distance flying will be better than all the training they can receive here and will prepare them for the long-distance work they must do from the western front over Germany and return.

"Once this is started there will be a continuous chain of aeroplanes connecting the United States with the continent of Europe from early morning until late at night, one machine leaving every ten minutes every day. The reason for planning for 1919 with a new machine, as stated above, is that our work in this country during the last year has not closed the gap which existed when we entered the war between what was going on in Europe and what was taking place here in aeroplane design, and the advance in the design and the production in England during the last year has been even greater than before. So that we are still further behind in our research and experimental work than we were a year ago.

"It is within the grasp of this country to win the war in 1919 in the air. Much has been said and written during the last year on how the United States would win the war in the air this year. We have lost that chance by our procrastination, delays, and mistakes, and unless the decision be made within thirty days to carry out a program in 1919, as I am suggesting, we will be too late again.

"With all the furniture companies in Grand Rapids, Mich., and with all the metal works in Michigan and Ohio and other States, and other great facilities and resources in this great country, 10,000 machines of the single type, like the Handley-Page aerial dreadnought, can be produced within the time above indicated, with the supervision of Mr. Handley-Page and his technical staff to do the engineering work. We will not disorganize a single factory or system employed by the Government now, only in so far as it is necessary to carry out the general production program, and from the organized state that some of these factories are now in we could soon be in an enormous production, making the machines identically the same as they are made in Engalnd. But to do as I have outlined, the Government must decide to act within thirty days.

2,000 by January 1

"If the program I am outlining is adopted we can have 2,000 of these four-engine type aeroplanes delivered in France by the Atlantic air route by January 1. I am not suggesting, however, that present production should be stopped, as all the aeroplanes will be needed and can be used, but I must say that had proper methods been adopted by the production board 2,000 of this type could have been on the western front by the Spring of this year, provided, of course, that the geared Liberty motor production had come through on time according to all promises made last year.

"We should bury our national pride and stop thinking about or trying to produce an all-American aeroplane. If there is an American aeroplane made today that can do it, let it be attempted. If it is not produced, but designed, then let it be known how long it will be before it is produced and what performance can be expected. If this takes longer than thirty days it will be impossible for any successful achievement on the western front in the Spring of 1919. I say, no matter whether it be English, French, Italian, Chinese, or even German, if it is good take it and defeat the Germans with it. This is what the Germans did with one of the first Handley-Page aeroplanes made, which unfortunately landed in a German airdome in Northern France, due to mist and fog, and the present type of Gotha German aeroplane is a reproduction of the earlier type of the Handley-Page, and I believe every one knows what the Gothas have been doing in England ever since production on these was started in Germany."

THE AERIAL MAIL SERVICE BETWEEN NEW YORK, PHILADELPHIA AND WASHINGTON IS PROVING TO BE OF GREAT VALUE IN DEFINING PROBLEMS TO BE SOLVED TO PERMIT AERIAL NAVIGATION ON SCHEDULE TIME FOR WAR AND UTILITARIAN PURPOSES

THE military authorities in charge of the Aerial Mail lines, together with the Postal authorities and the Aero Club of America officials have held a number of conferences to define the problems to be solved and the possible way of solving them.

When the aerial mail line started there was no data available regarding meterological conditions and the ways and means of overcoming the difficulties created by changing weather conditions. The aviators had had very little experience in cross-country flying, and there were no definitions of the conditions to be met in the attempt to fly daily on schedule time between New York, Philadelphia and Washington.

After a series of conferences between the military, Postal and Aero Club of America authorities, the following problems and possible solutions have been defined, and their definition promises to bring about developments of great importance from a military as well as a utilitarian standpoint, and greatly advance the possibilities of aerial navigation over great distances.

The following authorities participated in the various conferences:

Captain Charles Andrew Willoughby, A. S. S. C., in charge of the Aerial Mail Service for the Army; Captain B. B. Lipsner, of the Lubrication Division, Department of Aeronautics, U. S. Army; Second Assistant Postmaster General Otto Praeger, Louis C. Boldenweck, superintendent of the Aerial Mail Service; Alan R. Hawley, President, and Henry Woodhouse, Member of the Board of Governors, Aero Club of America; August Post, Secretary, Aerial League of America, Lieut. Torry H. Webb, Lieut. Paul Culver, Lieut. C. H. Miller, Lieut. James C. Edgerton, Lieut. Steven Bonsal, Lieut. J. Kilgore, Richard Vreeland, Assistant Superintendent of Mails, of New York; George L. Conner, Chief Clerk to Mr. Praeger; and Mr. Harry L. Hartung, representative of the Post Office Department at Belmont Park; Professor Charles Lane Poor, and Captain Robert A. Bartlett.

Problems to Be Solved to Make the Operation of Aircraft on Schedule Time Between Points of Departure and Terminal

The problems have been defined as follows:

(1) Difficulties to be overcome in flying from points of departure to terminal.

(2) Conditions to be met in landing upon arriving over the terminal.

On the whole, the problem of meeting the conditions after arriving over the terminal is the most difficult problem, because the fog or mist may screen the landing place and the aviator, therefore, must face the risk of running into houses if he flies low to find the landing place through the low-flying clouds, fog or mist.

Ascertaining the Extent to Which Visibility Is Possible Through Clouds, Fogs and Mists

In a general way, the weather conditions under which aviators have to fly can be characterized as follows:

(a) Ideal.
(b) Fair.
(c) Occasional clouds.
(d) Frequent clouds.
(e) High winds.
(f) Thick clouds.
(g) Thick clouds and high winds.
(h) Rain.
(i) Storms.
(j) Combination of storms and heavy fogs.

Aviators after leaving the point of departure under fairly good conditions may meet any of the above mentioned conditions, and may successfully overcome them, but the great difficulty is when they arrive at the terminal to find the landing field screened by fog or mist or low-lying clouds. The problem of landing is not only one of visibility but also of finding the direction of the wind, so as to land against the wind, since high winds can exist with thick fog, which makes a very difficult combination.

Weather Conditions Inconstant

Weather conditions are not constant, and the aviator who has been advised as he started from Washington that the Philadelphia or New York station was screened by fog may find upon arrival that the wind and sun have cleared the fog away and conditions are perfect for landing. The opposite may also be true. Therefore, unless the Weather Bureau gives conclusive reports that impossible weather conditions will exist for a period of time in that particular locality, the pilot must take a chance and fly under almost any conditions—until by continuous aerological observation there can be compiled reports of prevailing weather conditions in a given locality for a given period of time. Then the best localities will be selected for landing places.

Possible Solutions of the Problems

The following possible solutions have been defined to the problems:

(1) The establishing of aerological stations for the observation, measurement and investigation of atmospheric phenomena according to the plans developed by the Weather Bureau in making similar studies in Oklahoma, North Dakota, Texas, Georgia and Indiana. This will provide the data required to ascertain the prevailing atmospheric conditions and supplying data regarding the time required for mist and fog to clear up under different conditions, the extent of visibility through mist, fog and different cloud formations, etc. A study can also be made of local air currents, as the clearing of mists depends to some extent on prevailing wind currents.

(2) The use of aeroplanes equipped with two or more motors. The use of aeroplanes equipped with two or more motors will permit a pilot to fly low upon nearing the terminal and look for the landing place without fear of trouble through having to make a forced landing in case the motor stops. Having two motors, he will be able to continue to fly if one motor stops. At the same time, having two motors, he will also be able to fly under throttled power and extend the life of the motor to 500 or 600 hours or more, which is not possible if the motor is flown at full speed most of the time.

(3) In view of the fact that the aerial mail service affords extensive training in flying across country and dead reckoning required to fit the aviators for bombing, patrol and U-boat hunting duty, justifies the establishing to two or more auxiliary fields near the main station, so that if the aviator, upon reaching the station, finds the ground banked with fog, he may fly to an auxiliary field from five to fifteen miles away, which does not involve a serious delay in the delivery of the mail.

(4) Use of Radio Direction Finders to lead the aviator to the landing station under almost any condition.

(5) Employment of sounds, the same as at sea, using long and short whistle blasts and sirens to direct the aviator.

(6) The employment of lights to direct aviators was discussed but the general opinion was that its use was very limited, as lights do not penetrate fogs.

The Army authorities and aviators are working energetically with the cooperation of the postal and Aero Club of America authorities to solve these problems, the solution of which will be a valuable contribution to the advancement of the aeronautic art and science. They are doing pioneer work in an entirely new field, where there are no precedents to follow and it is all original research work of great importance.

MR. WOODHOUSE'S WORK COMMENDED

THE Executive Committee of the Aero Club of America, at its June 26th meeting, on the occasion of Mr. Woodhouse's 34th birthday, unanimously adopted the following resolution:

Whereas, Mr. Henry Woodhouse, having, in the opinion of the Governors of the Aero Club of America, earned an acknowledgment of their appreciation of his extraordinary achievements on behalf of the aeronautical movement, the movement for national preparedness, and the club, and

Whereas, The many undertakings initiated and so successfully carried out by Mr. Woodhouse and his associates having proven of great value to the country and the cause of the Allies, and the club, and

Whereas, The creation of aeronautic reserves and aerial coast patrol units, trained at private expense, resulted in giving the War and Navy Departments about 300 aviators, who were the first aviators to be sent to France; and

Whereas, By his exceptional vision, good judgment and energetic efforts Mr. Woodhouse has contributed in many ways to creating interest in the war, building the Air Forces, the Liberty Loans, the Aero Mail, delivering aeroplanes across the Atlantic, the French Aerial Warfare Exhibit and other activities of great importance as contributions towards winning the war; together with other services which he has rendered and

Whereas, By these activities and his untiring devotion to the cause for which the Aero Club of America stands, and to his colleagues, Mr. Henry Woodhouse has won the admiration and esteem of his fellow governors, therefore

Be It Resolved: That the Board of Governors of the Aero Club of America hereby tenders to Mr. Henry Woodhouse its thanks, and this expression of its appreciation of the invaluable services which he has rendered to the nation, the aeronautic movement, and the club.

AIR SERVICE INSTITUTE HAS CLOSE TO 2,000 MEMBERS—TO ESTABLISH FORTY AERONAUTIC LIBRARIES

THE Air Service Institute has been progressing in bounds. Although the plans to organize the Institute were only made on March 16, the Institute has already close to 2,000 members and it has achieved an international standing.

The Institute's last step to help the Air Service is a plan to establish an aeronautic library at each of the Army, Navy and Marine Corps Air Stations, schools and administrative divisions. Each library is to consist of selected aeronautic books and publications. Everything will be in duplicate, so one copy will be kept in the Commanding Officer's office and the other copy will be available to the officers and cadets.

Owing to the extraordinary demand on the time of officers in France, created by the upset conditions due to the German drives, Mr. and Mrs. Benjamin Thaw, the father and mother of Major William Thaw, the president of the Institute, have found it necessary to act for him in many matters. The nomination to the Presidency of the Air Service Institute was, therefore, accepted for Major Thaw, and Mrs. Thaw, who was to sail for France shortly, was to advise him—which has been done.

Mrs. Thaw is also to ask Major Thaw to select one of the most prominent American aviators to take the place of the late Major Lufbery as Vice-president of the Institute.

When the plans for the organization of the Institute were made and put in writing there was adopted the principle that, to quote:

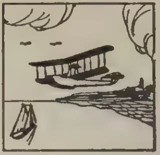
"Whatever is done must be done without taking Military and Naval men from their important work and without expense on their part, because they have already expenses which are excessive, compared with their small income and the high cost of living."

This is a very high-minded plan which is very thoroughly appreciated by the Air Forces. The letters of appreciation received by the Institute from officers would fill many pages.

The Institute has offices at the Union Trust Building, Washington, D. C., and at 297 Madison Avenue, New York City, and 42 Fambourg Paissonniere, Paris. The office of Lieutenant Granville A. Pollock, late of the Lafayette Escadrille, the Secretary of the Institute, are at Washington and all communications should be addressed to him there.

The Institute owns its own publication, *Air Power*, late *Navy Air Pilot*, which is now being moved from Pensacola, where it has been published for the past three years, to Washington, D. C. The dues are only $2.00, for which members receive *Air Power* for a year.

The News of the Week



Senate Allows Ryan to Form Aero Corporation

Washington.—John D. Ryan, Director of Aircraft Production, was authorized by the Senate June 28 to form an aircraft production corporation with a capitalization of $1,000,000.

The action looking to the formation of the corporation had been taken up last week, but it met with opposition from Senator Reed, who desired that the subject be laid before the Military Affairs Committee. This was done by Mr. Ryan and the legislation will go to the House as new.

As adopted by the Senate, the Director of Aircraft Production is empowered to form the corporation. He must subscribe and vote, for the Government, not less than a majority of the stock. It is further provided that the corporation must be dissolved within a year after peace has been declared.

The new corporation will closely resemble the Emergency Fleet Corporation and the War Finance Corporation, which were created for the period of the war.

Chicago Aeroplane Inquiry Probably Ordered by Hughes

Washington.—Federal Grand Jury investigation of the Chicago branch of the Aircraft Board soon may include other cities where there has been aircraft activity.

Announcement of the inquiry in Chicago by the United States attorney there gave rise to reports that the Hughes investigation of the aircraft situation had reached a point where instructions to act, through the medium of grand juries, would be sent Federal prosecutors in other cities by Attorney-General Gregory.

Washington is believed to have ordered the Chicago investigation. The prosecutor in that city, fully aware of the magnitude of the Hughes inquiry, hardly would have begun an independent quiz without first having obtained the sanction of the Attorney-General.

The Hughes inquiry has been in progress here upwards of six weeks. It has been a steady, daily grind behind closed doors, with the former Supreme Court Justice in the role of interrogator.

While Mr. Hughes will necessarily report in full to President Wilson, who asked him to conduct the investigation, it is also up to him to "punish the guilty," if there are any.

Discovery of irregularities or graft naturally would result in action by Federal prosecutors in the districts having jurisdiction, as in the case of the Chicago investigation, where, it is charged, Department of Justice agents have collected evidence showing "that money flowed through the office like water," and rich men's sons were given high salaried positions without regard to their qualifications.

Big Plane Coming for First Trip

Plans for the proposed aeroplane flight across the Atlantic assumed definite form when it was said that a 2,100 horsepower Caproni machine equipped for such a test had already been shipped from Italy to this country.

Officials of the Aero Club of America, which is arranging for the great undertaking, expressed the opinion that things would be in readiness to attempt the flight by September or October at the latest.

The triplane now on its way from Italy is fitted with three giant motors and embraces every improvement known to the art of aeroplane building. It is the very latest model of the Italian inventor and is designed to remedy every defect that developed in the earlier models.

Use of the machine for the proposed flight was obtained by the Aero Club through the offices of Lieutenant Belloni, of the Royal Italian Flying Corps now in this country.

Army Cognizance Board Changes Headquarters

The Joint Army and Navy Board on Aeronautic Cognizance has, due to the reorganization of the Signal Corps, been transferred from 1607 H Street, N.W., to Building "D," 6th and B Streets, Washington, D. C., and the section is under the supervision of Lieutenant W. W. Williams.

Ralph A. D. Preston, of the Goodyear Tire & Rubber Co., who has been commissioned a Lieutenant (Senior Grade) in the Naval Reserve

Preston Commissioned in Navy

Ralph A. D. Preston, who has been in charge of the Goodyear Tire & Rubber Company's Flying Field, near Akron, Ohio, where instruction in ballooning is given to student officers of the army and navy, has received a commission as lieutenant, senior grade, in the United States Naval Reserve Flying Corps. His headquarters are now in Washington, D. C. He has been placed in charge of repairs on U. S. Navy airships and will keep in touch with all work at the various naval air stations.

Despite Lieut. Preston's youth he is prominent in lighter-than-air aeronautic work, and probably has no superiors in this country in the matter of piloting balloons of all kinds. He was a member of the Goodyear crew that won the James Gordon Bennett Cup race at Paris in 1913, and the following spring won the elimination balloon contest at Kansas, qualifying as the American entrant in the International Balloon Race to be held at Paris in the fall of 1914. This race has not yet been flown on account of the war.

Lieut. Preston has represented the Goodyear Tire & Rubber Company in various capacities in Europe and South America and has had practical and scientific experience both as a tire engineer and as an aeronautical engineer. Since his assignment to the Goodyear Flying Field, has trained many young men who are now piloting kite balloons and airships in harbor and coast patrol, both in this country and in France, and has also directed a great deal of successful experimental and development flying. His appointment to his present important post in the United States Naval service augurs well for the rapid development of the operation of lighter-than-air craft in that service.

Air Raid Sirens Tested

New Yorkers within a radius of sixteen blocks from the plant of the Edison Electric Light Company, at Fortieth street and First Avenue, heard on June 26th for the first time the tones of the siren that with scores of others will warn them to scurry to the cellars to dodge the bombs of enemy aircraft. Shortly after 9 o'clock the siren on the roof of the Edison plant took up its wail, but the police had previously prepared those in the vicinty by telling them that the test was to be made.

Within the immediate vicinty of the Edison building the siren could be easily heard, but several blocks distant the roar of the city's traffic mingled with the warning wail until at a distance of sixteen blocks the cry was drowned entirely. The siren was tested for five minutes. More sirens, however, are to be placed about the city and their megaphone volume will be itensified.

Record Aerial Mail Trip

Government officials visited Belmont Park on June 26th to inspect the work of the aero mail aviators. H. L. Hartung, who superintends the aero mail service at New York, acted as guide.

Lieut. Webb started at 11:59 with 125 pounds of mail and carried as passengers Inspector Creen and Lieut. B. M. Bryant of the Signal Corps. The trip was made in record time, in spite of the extra weight, the running time between New York and Philadelphia being forty-five minutes.

Inspector T. S. Connor, chief clerk of the Second Assistant Postmaster-General's Department, expressed satisfaction with results.

He called attention to the fact that the record of the previous week was 100 per cent, not a trip being missed.

Maj. Bishop Brings Down His 72d Hun Plane

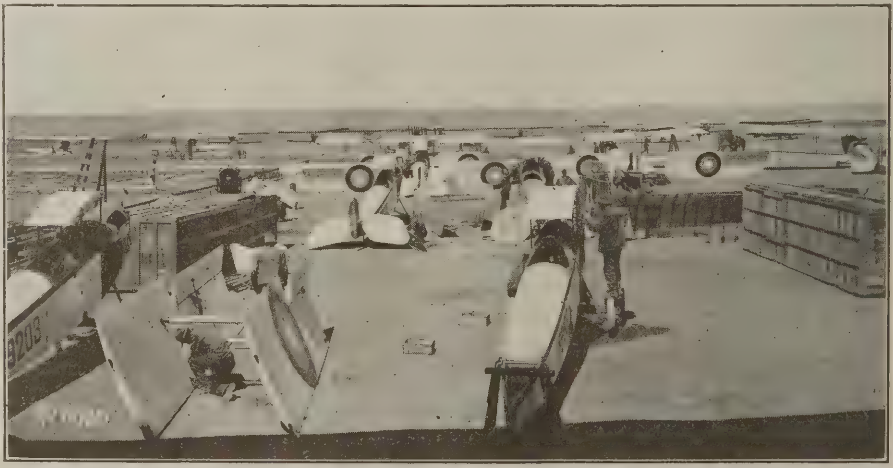
Toronto, Ont.—Major William Avery Bishop, Canada's champion, has become world's champion air fighter, adding since his return to France four weeks ago twenty-five aeroplanes to his earlier record of forty-seven. He cabled on June 23rd as follows:

"Returning to England permanently. My total now seventy-two." Major Bishop has been appointed to the British Air Board and his fighting career is closed.

His nearest rival was the German, Richthofen who had seventy planes and ten balloons, including those crashed behind Allied lines.

Mimic Night Air Battle Fought Over Baltimore

Baltimore—Two big aeroplanes from the Potomac aviation field, one representing a German bomb thrower, piloted by Lieut. Theodore Maynz, with Lieut. William F. Brown gunner, and the other an American defender, piloted by Capt.



Cadet aviators constructing aeroplanes at Rockwell Field, San Diego.
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Percival Dodge, engaged in mimic battle over Baltimore city on June 25th.

The mimic battle was arranged in aid of War Saving Stamps.

Capt. La Guardia Makes Long Flight to Fetch Machines

Rome.—Capt. Fiorello H. La Guardia of the American Flying Corps and representative in Congress from New York City, recently made his first long cross country flight in a Caproni aeroplane. He went to the north of Italy to get machines for the American training school and, because it would take too long to ship them by train, the Captain decided to bring them by air. He was assisted by Lieutenants Spencer Kerr of Baltimore, Mowatt Mitchell Wandell Hauch of California and Harris and Agar.

The exact route taken by the American aviators cannot be mentioned but it can be said that it was longer than from Rome to Milan. The Americans made the flight in four hours.

First Wounded Airman to Get Noted Guitar

The first wounded American aviator to return to the United States will have something to come back to besides an adoring public. Frances Starr's guitar which she played in "Rose of the Rancho" is to be presented to that hero by Mrs. Orlando Rouland, 130 East Fifty-seventh Street, who is collecting musical instruments for military men.

Concrete Landing Beach for Navy Sea Planes

Washington, D. C.—A concrete landing beach with hangars and other structures for the accommodation of naval seaplanes is being built by the Navy Department on a tract of reclaimed land on the flats on the left bank of the Anacostia river.

The temporary use of land, covering an area of 1,500 by 600 feet, has been authorized by the Secretary of War, who has jurisdiction in the premises. The station is located near Giesboro point and is almost directly opposite the Army War College.

In granting its use for naval seaplanes it was provided that the structures should be removed within six months after the close of the war. It was also provided that there should be no interferences with navigation of the river.

New Flying Field Opened

Washington, D. C.—The War Department authorizes the following statement: Mather Field, at Sacramento, Cal., was opened for training aviators on June 24. This is one of the new training fields for flyers recently completed for the Department of Military Aeronautics and is the twenty-eighth field in active operation. It was named in honor of Second Lieutenant Carl S. Mather, Signal Reserve Corps, Aviation Section. Major D. C. Emmons, J. M. A. S. C., is commandant at Mather Field.

A New Publication

AERIAL AGE has much pleasure in welcoming to the fraternity of aviation publications *The Call Field Engineer.*

This is a new publication in magazine form being, as its name implies, the organ of the U. S. Aviation School at Call Field, Wichita Falls, Texas. It is quite a pretentious venture, printed on heavy paper in colors. It contains a diversified assortment of subjects, from well written technical articles to some very interesting short stories. The work is all contributed by the personnel of the Field, and is most creditable to it. Lieut. H. E. Willingham is the Editor.

Royal Flyers Drop Sam Brown Belt

Washington, D. C.—"The Royal Air Force is the only arm of the British service whose officers do not wear the 'Sam Brown' belt. All of the allied troops have adopted the 'Sam Brown' belt. It was first worn by the British, but the French adopted it and then all the officers of the allied services, the Americans in France being the last to take it up. In the beginning the members of the Royal Flying Corps wore the belt, but when the air force was reorganized and consolidated under the name of the Royal Air Force the 'Sam Brown Belt' was abandoned by the airmen.

"The Royal Air Force is an independent branch of the British service, separate entirely from the Army and Navy.

"Some persons do not understand the insignia of the British soldiers. It may be noticed that the officers and men wear stripes on the right sleeve below the elbow near the cuff. The first, or lower one, which is red, indicates that the soldier entered the zone of active operations in 1914, and one additional stripe (blue) is added every year of service thereafter. There is scarcely a regiment of British soldiers that has a hundred of its original quota still in active service."

Air Postage Cut to 16 Cents

Washington.—The Post Office Department announced on June 28 that after July 15 the postage on aero mail will be reduced from 24 cents to 16 cents for the first ounce and 6 cents for each additional ounce or fraction.

This is a 6 cent rate for postage and the usual 10 cents for special delivery.

Commissions for 1700 Aviators

Washington.—Commissions as first and second lieutenants in the Non-flying Section of the Signal Corps Reserves will be awarded to 1700 cadet flyers now training in British, French and Italian flying schools. After they have been qualified as flyers the commissioned officers will be transferred to the flying section.

First German Seaplane Downed

Washington.—Ensign Stephen Potter, U. S. Naval Reserve Force, who was killed in action on April 25, is credited with shooting down the first German seaplane destroyed by an American naval aviator. On March 19, 1918, a long-distance reconnaissance of the German coast was made by large American flying boats operating from a British Royal Air Force Station. Two American naval aviators accompanied this expedition, and one of them, Ensign Potter, was successful in shooting down a German seaplane which attacked the formation. A second enemy machine was put to rout at the second time. After making a highly successful reconnaissance flight the seaplanes returned to their base, having sustained slight damage. The return trip was made in 6 hours and 33 minutes of actual flying.

From the Flying Fields

A hospital airship is the latest innovation at Ellington Field. The ship has been assembled for its initial flight. It will at once be placed into active service.

The machine is a Curtiss JN4H type, with an Hispana-Suiza motor. All interior parts have been coated with white enamel, including the struts and landing gear, and, instead of the usual insignia on the wings, there are large red crosses. A gilded Caduceus is on either side of the rudder and the number of the plane is 38175.

First Lieut. William H. Becker has been appointed assistant to First Lieut. Frank M. Bartlett, officer in charge of flying of the Kelly Field Flying Department. He succeeds Lieut. Newell E. Thomas, who has been transferred elsewhere.

The Goodyear D12 Makes 360-Mile Journey

The performance of the airship D12 in a 360-mile flight from the Goodyear Balloon Field, near Akron, O., to Dayton, O., and return, marks the first successful long distance airship flight made in this country. The accomplishment is noteworthy in that it is indicative of the possibilities of a most important branch of our aeronautical service that has heretofore commanded but a small share of public attention, because of the predominance of an almost unlimited aeroplane program.

The journey of the D12 was the longest in which any American airship has ever flown to a definite objective, made a successful landing and returned to its hangar successfully. The start was made from Akron with pilots Ralph H. Upson and Herman Kraft in charge. Flying over Springfield, Ohio, at an altitude of 4,000 feet, the big airship was met by two Liberty-motored aeroplanes from the Dayton Wright flying field. Under convoy of these two planes the D12 arrived at Dayton, and after circling above the city several times, amid the blowing of whistles and ringing of bells, landed gracefully in the flying field where sufficient space had been cleared to receive it.

Upon emerging from their car the two pilots were warmly greeted by the aviators there, and great interest was shown both in their craft and their accomplishment. As there was no hangar at the field large enough to contain the airship, it was secured for the night under guard supplied by Col. Deeds.

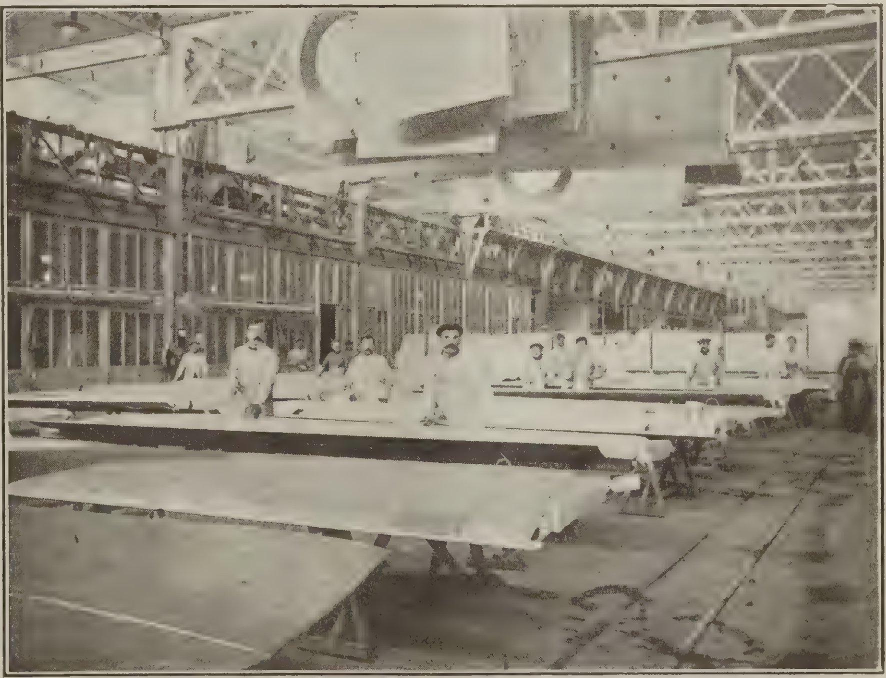
At 10:40 the next morning pilots W. Pouchot and J. A. Boettner, took charge of the airship and started on the homeward journey, accompanied by a squad of twenty-five aeroplanes that acted as a convoy for about ten miles. Secretary of War Newton Baker, arrived at the flying field just as the ascent was being made, and watched the big airship soar away, as long as it was visible. In just four and one half hours it was quietly resting in its hangar, having finished the longest flight of lighter-than-air craft of the dirigible type, ever made in Ameirca.

The visit to Dayton was timed during the convention of the Society of Automotive Engineers, and many aeronautical engineers who had not previously had the opportunity of seeing an airship in action, took advantage of this opportunity to examine it.

That the operation of airships of this type need not necessarily be confined to balloonists of great experience and reputation, is proven by the successful flight of the two pilots who accomplished the return journey. These two young men were trained to fly balloons in the Goodyear Balloon School, just as thousands of other young men are being trained in our mammoth aviation camps to operate aeroplanes. Their flight was equally as successful as that of the two veterans who took the airship to Dayton.

Aircraft of this type are playing a very important part in the war. As coast and harbor patrols their work has been effective. In the recent submarine scare on our eastern coast aircraft of this type joined in the search for the elusive U-boats. In many ways such airships are performing creditable service—not as spectacular nor as widely heralded as that of aeroplanes, but performing efficiently and watchfully. Many pilots that have received their training in the Goodyear School, which is constantly training student officers of the U. S. Navy, are now flying airships in coast patrolling in France.

The government has recently taken up the use of these airships on a more extensive scale than before, which portends the training of many more young men as pilots for this type of aircraft.



The "dope" room in a French aircraft factory. (French Official Photo)

The AIRCRAFT TRADE REVIEW

New Glenn Martin Plant Finished

Cleveland.—The new plant of the Glenn L. Martin Co. has been dedicated. The company will complete one advanced type aeroplane every 10 days until October, when production will be speeded up to one plane daily.

Detroit S. A. E. Moves Offices

Detroit.—The offices of the Detroit section of the Society of Automotive Engineers will be located at 701 Book Building on and after June 21. The society will inaugurate an engineering reference library for the convenience of its members in checking up technical information, and a file of the leading engineering journals will be on hand.

Prohibit Castor Bean Imports

Washington.—Importation of castor oil or castor beans from the West Indies, Mexico, Central America, Columbia and Venezuela is prohibited by the War Trade Board except when the United States Government is the consignee or when the importation is approved by the Bureau of Aircraft Production. Licenses for importation of castor beans and castor oil have been revoked as to shipments made after June 10, 1918. All applications for the importation of these commodities from the countries named when the consignee is other than the United States Government will be referred to the Bureau of Aircraft Production for approval.

Personal Pars

C. T. Chenevert has been commissioned a senior lieutenant in the Bureau of Aviation Operation, to supervise navy trucks in France. He was formerly vice-president of the Denby Motor Truck Co., Detroit, Mich.

Charles B. Wilson, president of the Wilson Foundry & Machine Co., Pontiac, will assume the added duties of assistant general manager in charge of production of the Curtiss Aeroplane & Motors Corp., Buffalo.

Harold N. Bliss, formerly production manager of the engine department of the Timken-Morse Aircraft Corporation, is now superintendent of the engine department.

Howard Emery, who was manager of the Detroit plant of the Aluminum Castings Co. some years ago and was later transferred to the managership of the Manitowoc plant, has returned to the Detroit factory to occupy the position of manager. This position was recently vacated by Charles B. Bohn.

Charles C. Hanch, treasurer of the Studebaker Corp., South Bend, has been appointed chief of the Automotive Products Section of the War Industries Board. He succeeds H. L. Horning, whose resignation was accepted the last week in May.

Mr. Hanch will assume all of the duties which heretofore have been performed by Horning. He will have complete charge of all automotive purchases both for the United States army and for the Allies, these to include motorcycles, trucks, ambulances, trailers, passenger cars, tanks, artillery tractors, armored cars, aeroplanes, stationary gas engines and all automotive accessories.

The Warner Airplane Control Co. have done a real service by erecting guide posts at the Dayton aviation fields

Army Aircraft Service Offices Under One Roof

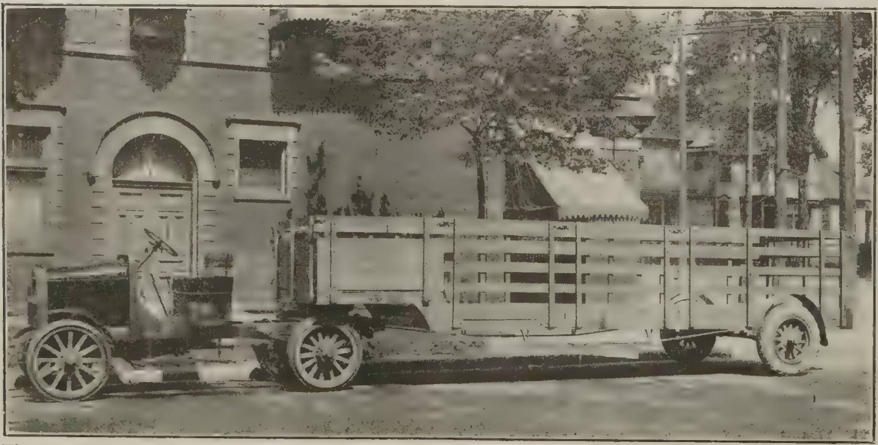
The War Department authorizes the following statement:

The office of John D. Ryan, Director of Aircraft Production and chairman of the Aircraft Board, was moved from the Munsey Building to Wing 8, second floor, Building "D," Fourth Street and Missouri Ave NW.

The Aircraft Board has been assigned offices in the Fourth Street wing of the same building. The Bureau of Aircraft Production is now located in the Fourth Street end. The removal of the offices of the Director of Military Aeronautics to the Sixth Street or Western end of Building "D," brings the two main branches of the Army Air Service under one roof.

The Washington office of the Aerial Mail Pilots and the Washington Aviation Examining Board are also now located in the Sixth Street end of this building. Offices have also been assigned to the British, French and Italian Aviation Missions in the same section of the building.

All the telephones of the Army Air Service are now listed under the War Department exchange.



The combination of an Acason light tractor truck and a special Fruehauf trailer is the latest special aeroplane carrier for fast work

Packard Ships 1,000 Aeroplane Motors

The one thousandth Liberty aeroplane engine produced by the Packard Company was shipped from the factory last week, just a year to a day from the sending to Washington of blue prints and parts which formed the start of the Liberty motor design.

The dispatching of the one thousandth engine was celebrated quietly, but none the less exultantly, by the men who within a year have had the successive responsibilities of producing the first Liberty engine by hand, the first Liberty engine to fly, the first Liberty engine made from tools designed for quantity output, and now their first thousand perfected engines.

Among those who witnessed the crating of the motor for shipment was the young engineer who on May 29, 1917, took down to Washington a trunk, checked as personal baggage, which contained complete blue prints and an all-steel cylinder of an aviation engine.

When Liberty engine No. 1,000 was completed a telegram was sent by the two Liberty engine builders to President Wilson and Secretary Baker announcing with "solemn thankfulness" the completion of the first thousand. In reply Secretary Baker wrote his congratulations, praising the "most commendable zeal and spirit with which the task has been accomplished."

The Acason Trailer

A motor wagon for aeroplanes is one of the war developments. It is now possible to take a complete plane, run it up on skids aboard a Fruehauf trailer and then have an Acason light type tractor truck haul it at good speed to its destination. The practise is now under way in certain sections of the country when it is desired to move planes from one place to another without using their own power. In the case of disabled planes it is handy to move the entire plane from wherever it may be into the reservation hangars where it can be given speedy and proper attention.

The trailer is 25 feet long, 7 feet wide, with racks 48 inches high. It is equipped with 38 x 7 Goodyear all weather tires on the trailer and solid Goodyear on the Acason Motor Truck Company's light type tractor. The trailer has a capacity of 3 tons. Its development is the result of French war experience.

It is believed that the combination will prove of much value in the commercialized aeroplane activity which is planned for after the war period. It has caused favorable comment among prospective commercial aeroplane builders in Detroit, which city is looking forward to being one of the big aeroplane manufacturing centers at the conclusion of the war.

Bosch Magnetos Re-christened "Liberty"

New York.—In so far as Australia is concerned, Bosch magnetos are now known as Liberty magnetos. The change in name follows an order of the Comptroller General of Customs for Australia prohibiting the importation of magnetos bearing the name Bosch. The magnetos themselves are not banned, but the name is, and hence, on all shipments to Australia, Tasmania and New Zealand the name Bosch has been supplanted by the name Liberty. The edict applies to magnetos shipped separately or as part of the equipment of cars, trucks, motorcycles, etc., but instruments shipped prior to June 20 will be admitted under the name Bosch. The Bosch Magneto Co. expects to ship 7,000 instruments during the current twelvemonth.

N. Y. U. Faculty to Aid in Aircraft Work

By arrangement with the Navy Department the scientific faculty of New York University will be organized into a committee of research and consultation to help the aircraft programme.

The Chairman will be H. M. Avram of Slocum, Avram & Slocum, engineers and industrial managers, who is a lecturer on industrial engineering in the School of Applied Science at University Heights.

Problems connected with aeroplane construction, improvement and operation will be submitted to the committee and assigned to members whose scientific equipment fits them for the special task to be performed. The laboratories and workshops of the university will be used for the experiments and mechanics will be employed under the direction of the professors to assist in working them out.

REPORT ON AIRCRAFT SUPPLY OF GREAT BRITAIN AND DISCUSSION OF THE DIFFICULTIES INVOLVED IN PRODUCTION

The Secretary of the Smithsonian Institution has prepared the following extract from the Report for the year 1917 *of the War Cabinet of Great Britain relating to supply of aircraft. It is reprinted with the permission of Lord Reading, the British Ambassador.*

The description given of the difficulties in the way of obtaining a supply of aircraft is so accurate and is so general in its application to all countries that it is believed it should be given as wide a circulation as possible in America. Its application to the American aircraft situation is evident if we remember that Great Britain has been at war since August, 1914, *and that every resource of the country, famous for generations as the center of mechanical developments, has been applied to the problem of the production of aircraft. This enables us to appreciate more clearly the progress made by the United States in* 1917-18:

Supply of Aircraft

[The above recital indicates generally what steps have been taken in matters of administration and control.] It should be supplemented by some general account of the measures taken as regards supply of aircraft and the development of that supply.

In endeavoring to describe the measures taken to meet the aircraft needs of the Navy and Army, the writer is at once confronted by the fact that the information desired by the country is precisely the information desired by the enemy. What the country wants to know is what has been the expansion in our Air Services; whether we have met and are meeting all the demands of the Navy and of the Army, both for replacement of obsolete machines by the most modern types and for the increase of our fighting strength in the air; what proportion of the national resources in men, material and factories is being devoted to aviation; what the expansion is likely to be in the future. These are precisely the facts which we should like to know with regard to the German air service, and for that reason it would be inadmissable for us to supply Germany with corresponding information about ourselves by publishing a statement on the subject.

It can be said that the expansion of our Air Services is keeping pace generally with the growing needs of the Navy and the Army.

The brilliant part played by the Royal Flying Corps and the Royal Naval Air Service in the battles of the Somme, Vimy, Messines and Ypres has been described by the Commander-in-Chief, who has also borne frequent testimony to the inestimable value of the work performed daily and nightly by the two air services. It is fair to say that not even the well-known superiority of our airmen over those of the enemy would have enabled them to have earned the Commander-in-Chief's praise in so unstinted a measure unless they had been supplied with satisfactory machines and equipment from home. It is rather the fashion to criticize the quality of our machines. Most of the critics, however, are ignorant of the technical and manufacturing difficulties which have to be overcome in order to keep up a constant and increasing supply of the most up-to-date machines. Not only are the techincal difficulties and the resultant research and experimental work formidable in themselves, but the task of building up in war time, without seriously affecting the requirements of other services, a new industry of a most highly skilled character necessarily puts a heavy strain upon the organizing and manufacturing ability of the country. The growing realization of the increasing importance of aviation as an artificer of victory has recently been reflected by the concession of first priority to labor and materials required for aircraft production.

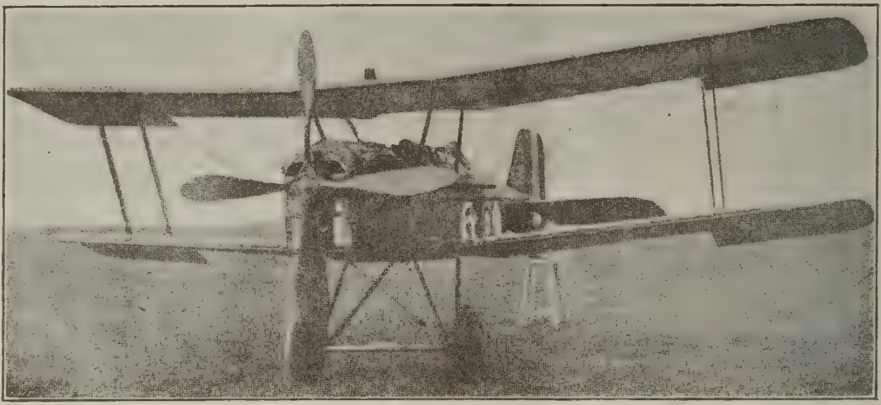
The nature of the duties performed by the Royal Naval Air Service, both in conjunction with the fleet and from naval bases, makes secrecy essential to success. It is, unfortunately, inevitable, therefore, that the public should remain in the dark on this subject; but the Germans, who in this matter are perhaps the best judges, have good reason to know and to regret the great and growing activities of the Royal Naval Air Service. All that has been said regarding the difficulties of supplying the requirements of the Air Forces operating over the land applies equally to the supply of those which operate over the sea. In both cases difficulties are being overcome and the outlook is improving.

The science of aeronautics is in a state of constant and rapid development; improvements in engines, aeroplanes and their numerous accessories are constantly being worked out. But the interval between the discovery of an improvement and its introduction into the service is, owing to technical considerations, very much longer than is commonly supposed. Experience shows that, as a rule, from the date of the conception and design of an aero-engine to the delivery of the first engine in series by the manufacturer, more than a year elapses; the corresponding period for an aeroplane is about one-half as long. Consequently, plans have to be laid for a long period ahead, and these plans are liable to be upset by many uncertain factors. The hopes based upon the promising results given by the first experimental engines of a new design are frequently disappointed owing to difficulties of a bulk manufacture or to

(*Continued on page* 840)

A German machine captured by the French and subsequently used for training purposes. (French Official Photo)

THE ENGLISH S. E. V. A. SINGLE-SEATER FIGHTER



Three-quarter front view of the British S. E.

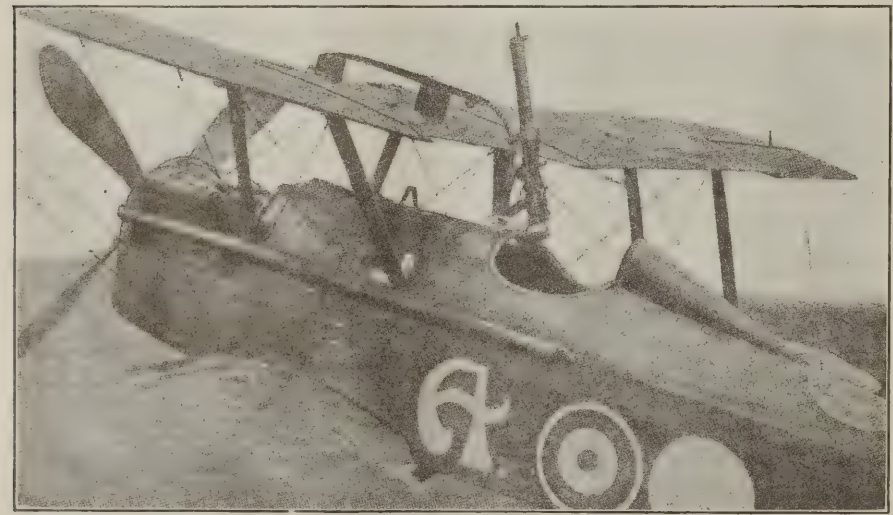
The following description and illustrations published in the German aviator journal, *Deutsche Luftfahrer Zeitschrift,* appears to be an official German report on the British S. E.

The aeroplane in question was built by Vickers, Ltd., and numbered B.507, wearing further as recognition initial or that of a squadron an A as well as a white circle. The propeller is marked: S.E.v.A., which leads to the idea that the older model of this same aeroplane type with the 150 h.p. Hispano motor not geared down is called S.E.v.

The biplane has a surface of 22.8 square metres, and both planes, connected with but one pair of struts to each side, have a span of 8.15 metres, and a chord of 1.52 metres, the gap from the top of the fuselage amounting to 0.45 metre.

No arrow-shape prevails. The V-shape of the equal-sized ends of the upper and lower planes mounted on the centre section and respective body rudiments amounts to 1.71 degrees.

The sight field of range is improved by cutting the centre section in the middle and the lower planes near the body.



The front part of the body of the S. E.

Above the angle of incidence is 5 deg. mean, below by the body 6 deg., by the struts 5 deg.

Both plane spars show sections of I shape, whereas the longerons of the rudiment pieces, running through the body are steel tubes of 1.75 millimetre thickness, and 45 mm. outer diameter. The plane ribs show the usual construction of most British air craft.

There are no compression struts between the spars, some of the ribs being solid struts instead.

The interior wiring of the planes between the body and the struts is carried out in simple profile wire, that of the overhanging ends of thick-ended wire.

A wood strip forms the back edge of the planes. Further, two auxiliary ribs ranging from the leading nose edge to the main spar are arranged between each two ribs.

The fabric is sewed together with the ribs, and is painted yellow below, browned above, as is the fabric of the body. Shoe-eyes are arranged on the underside of the trailing edge of the plane to assess the pressure.

The centre section struts are covered steel tubes. The plane spruce struts rest in long stampings, serving as fixing points of the vertical wiring.

Profile wire is employed for the plane cross wiring with twin wires for those carrying load and single for the counter ones.

The two spars of the upper planes are strengthened further between the centre section and the struts with two wires each. Unbalanced ailerons are hinged to the back crossbar of the upper and lower planes.

The body shows the usual strut cum wire combination, being rounded above with half-circle frames and fairings, and having three-ply wood planking of 4 millimetre thickness to the pilot's seat. Fuselage longitudinals and struts have sections of I-shape, except the vertical struts behind the pilot's seat, which are worked out round.

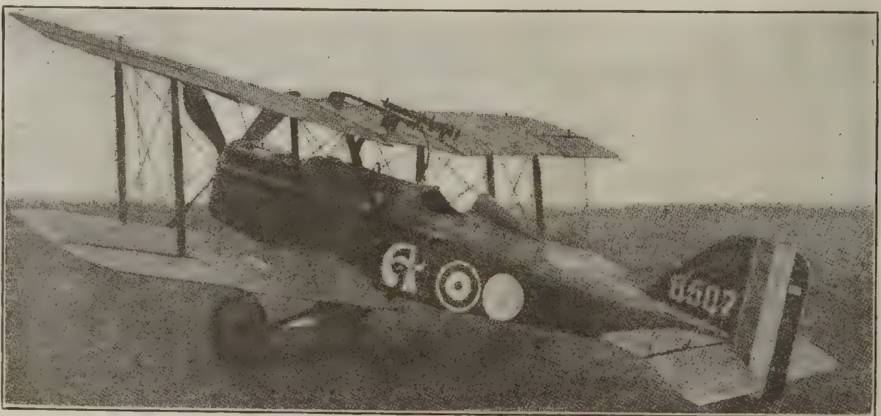
The tail-plane is curved to both sides and fixed to the body, so that the angle of incidence can be varied during the flight within the limits + 4.5 deg. and — 3 deg. To this end the front spar is turnable, while the rear spar, with its wiring, is fixed to a tube, arranged shiftable to the body stern post. This tube rests with a piece of thread in a gear-nut, again resting in the stern-post fixed, yet turnable.

When the nut is turned from the pilot's seat by means of wheel and cable, the tube is displaced upwards or downwards, transferring thereby the same manœuvre on the rear spar of the tail-plane, and thus its angle of incidence changes.

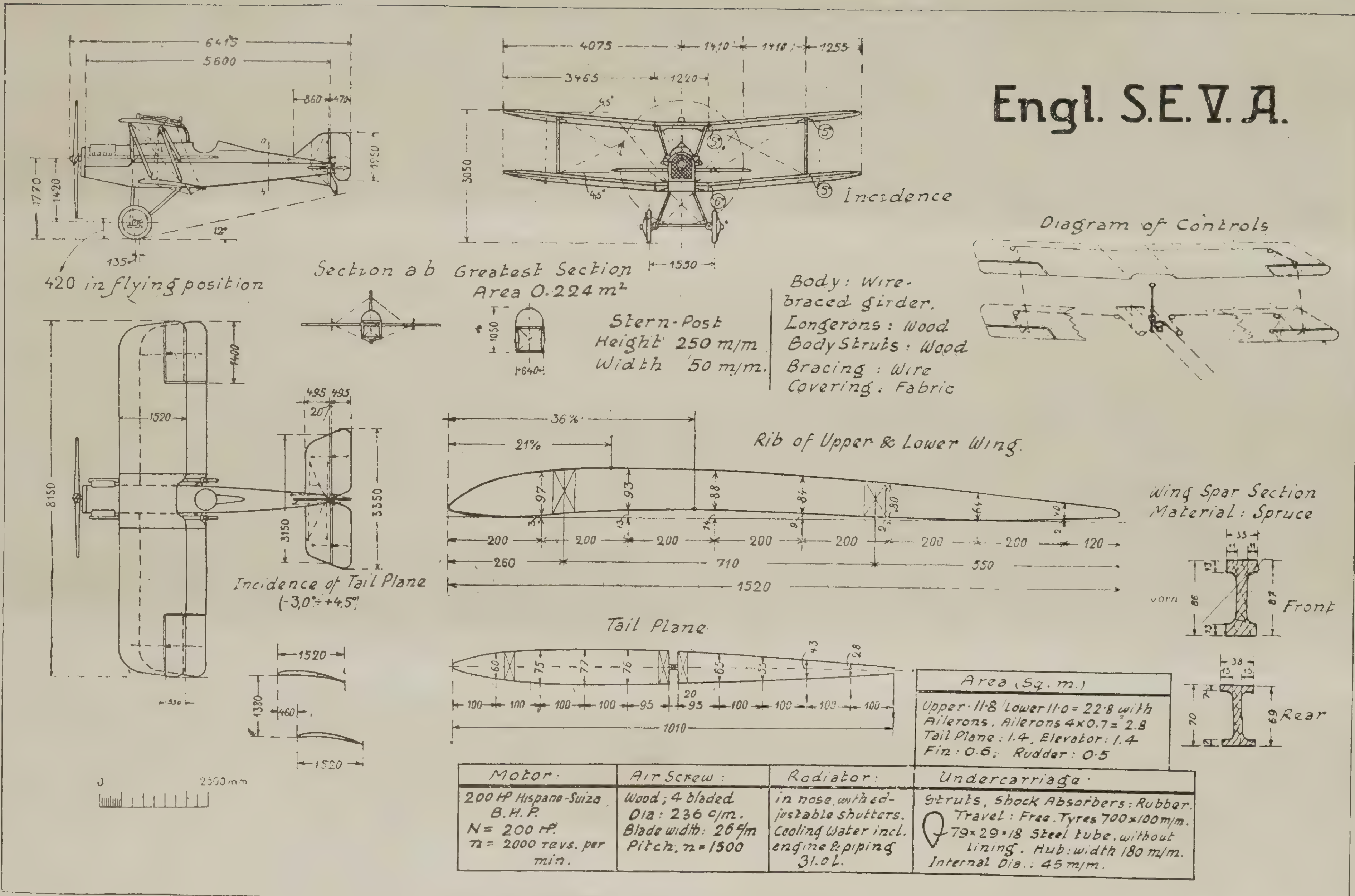
The elevator hooked to the fixed tail-plane partakes in this movement. The wires for operating the elevator are led through the body and tail-plane, which certainly saves air resistance, yet makes twice a 20 deg. direction change of each wire necessary. Main and tail-planes are equipped with cellon windows, rendering a control of the rollers possible.

The under-carriage shows the normal form. The through-running axle rests between two auxiliary ones. There is no limit of the springing range.

The tail skid shows an unusual construction, being arranged turnable behind the stern post and connected with the rudder cable by intermediance of springs.



Three-quarter rear view of the S. E.

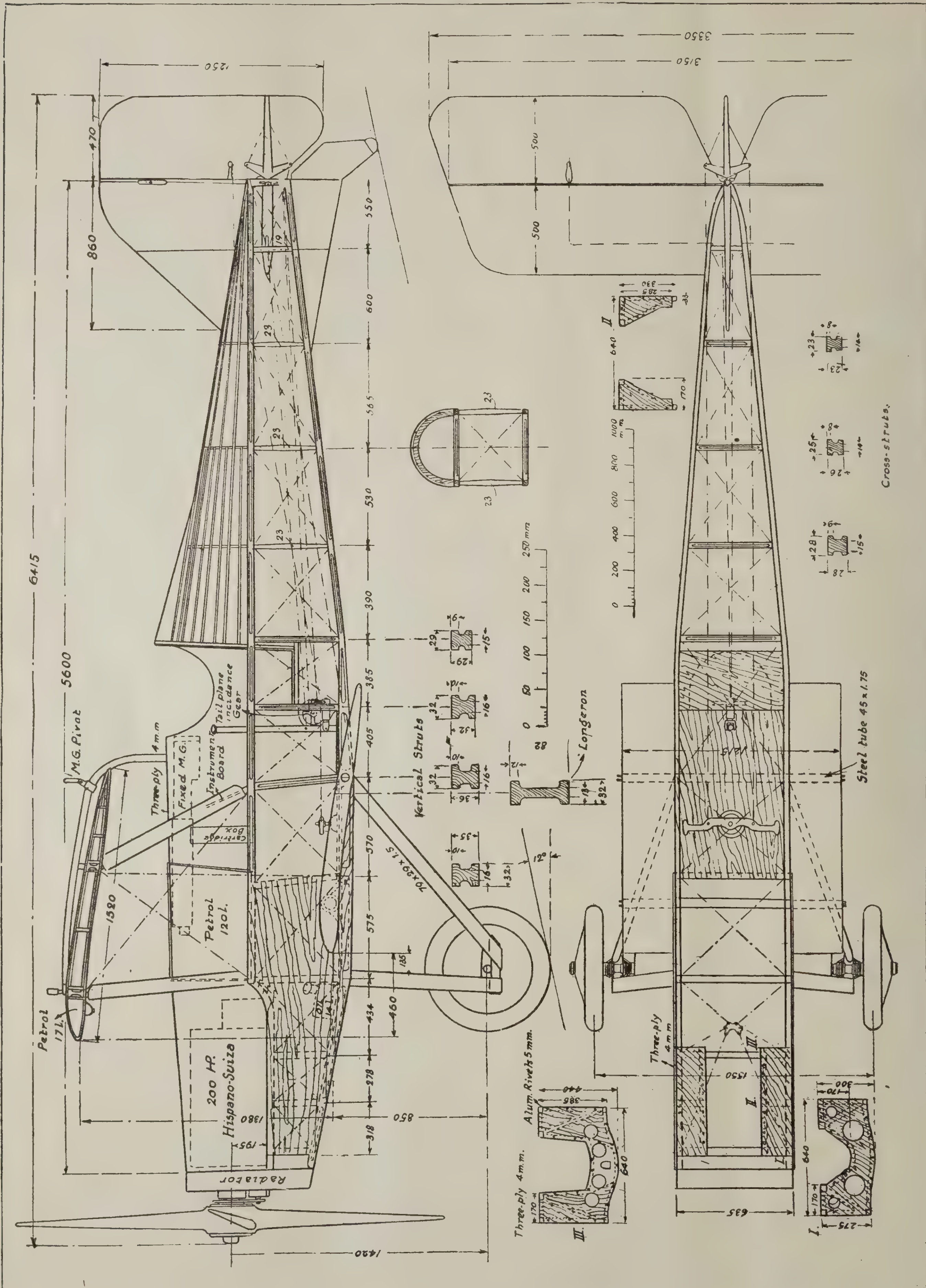


Body: Wire-braced girder.
Longerons: Wood
Body Struts: Wood
Bracing: Wire
Covering: Fabric

Area (Sq. m.)
Upper 11·8 Lower 11·0 = 22·8 with Ailerons. Ailerons 4×0.7 = 2.8 Tail Plane: 1.4, Elevator: 1.4 Fin: 0.6; Rudder: 0.5

Motor:	Air Screw:	Radiator:	Undercarriage:
200 HP Hispano-Suiza B.H.P. N = 200 HP. n = 2000 revs. per min.	Wood; 4 bladed Dia: 236 c/m. Blade width: 26 c/m Pitch, n = 1500	in nose, with adjustable shutters. Cooling Water incl. engine & piping 31.0 L.	Struts, Shock Absorbers: Rubber. Travel: Free. Tyres 700×100 m/m. 79×29×18 Steel tube, without lining. Hub: width 180 m/m. Internal Dia.: 45 m/m.

The English S.E.V.A. single-seater fighter.



The English S.E.V.A. single-seater fighter.

A brass skid bow is sprung by means of two spiral pressure springs which are prevented from sideway turning by inserted telescope tubes.

According to the firm's sign board the Wolseley-Hispano-Suiza engine gave the 30th August, 1917, on brake 206 h.p. = 203 P.S. at 2005 revolutions. The r.p.m. of the four-bladed airscrew is geared down in the ratio of 4 to 3.

The exhaust gas is led behind the pilot's seat in two tubes to each side of the body. The motor sits so that there is free accessibility after removing the bonnet. The radiator forms the bow of the body.

A cover arrangement makes it possible to uncover the body about half way from the pilot's seat.

The main petrol tank of 120 litres' capacity is placed behind the motor on the upper fuselage longitudinals. A gravity tank of 17 litres capacity is arranged in the centre section between the leading edge and the main spar. The oil tank of a capacity of 14 litres lies cross in the engine frame below the rear edge of the motor.

The fuel suffices for a flight of about two hours' duration.

Following instruments are arranged in the pilot's seat:

To right: A box for the light pistols; a contact breaker for the self-starter; a contact breaker for the two magnetos; a triple led cock for the gravity and pressure petrol; a triple led cock for the hand and motor air-pump; a thermometer for the water of the radiator; the petrol gauge placed on the back side of the main tank, and a manometer for air-pressure.

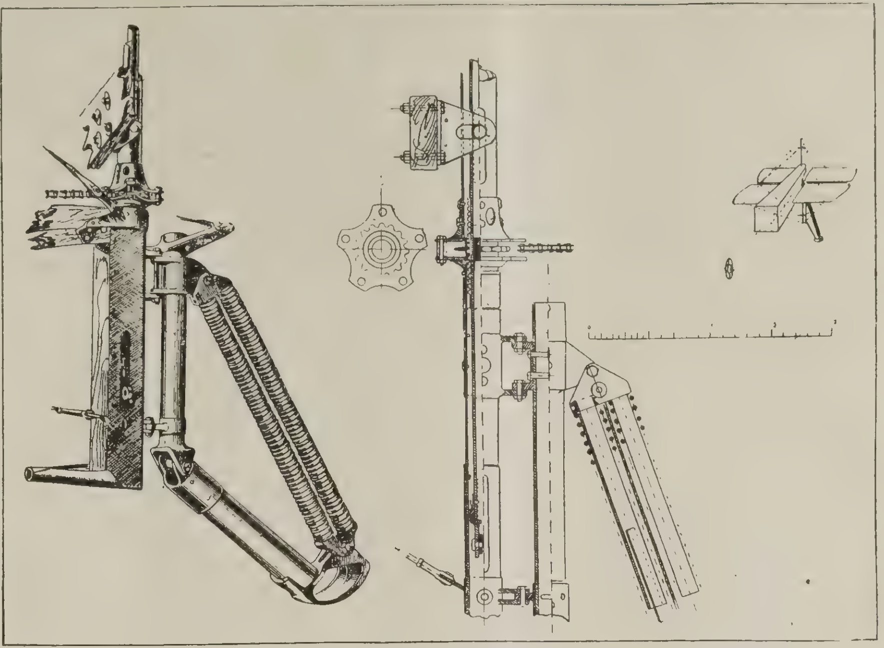
To left: Gas lever; lever for regulation of the gas in altitude flights; lever for operating the radiator blinds, clip for three light cartridges. On the bottom is further arranged a hand-pump for the hydraulic machine-gun gear; two boxes for drums for the movable machine-gun and the self-starter.

A square windshield of Triplex glass is placed in front of the pilot's seat. Behind it a box is arranged in a queer position to the body with access from outside.

The fixed Vickers' machine-gun lies to left of the pilot inside the body fabric. The cartridge girdle is of metal. The firing of the machine-gun takes place hydraulically by means of a control arrangement, placed in front of the motor and connected with the machine-gun through a copper main, as well as driven from the air screw by a gear set. The firing lever sits on the stick.

On the bow-shaped iron band lying on the centre section rests a Lewis gun, which can be pulled down during the flight to permit vertical firing.

The empty weight of the aeroplane was worked out at 706 kilos, distributed as follows:



Tail plane incidence gear of the S.E.

	Kilos.
Engine	225.0
Exhaust collection	12.0
Self-starter	3.6
Radiator	23.8
Radiator water	31.0
Air screw	26.6
Main petrol tank	17.8
Gravity petrol tank	6.5
Oil tank	3.9
Motor equipment	6.4
Body with seat and plate covers	151.0
Tail-plane angle of incidence change arrangement	1.9
Under carriage	40.8
Tail skid	3.7
Pilotage arrangement	5.4
Planes with wiring	112.2
Vertical and horizontal wiring	21.0
Body equipment	14.0
	706.0

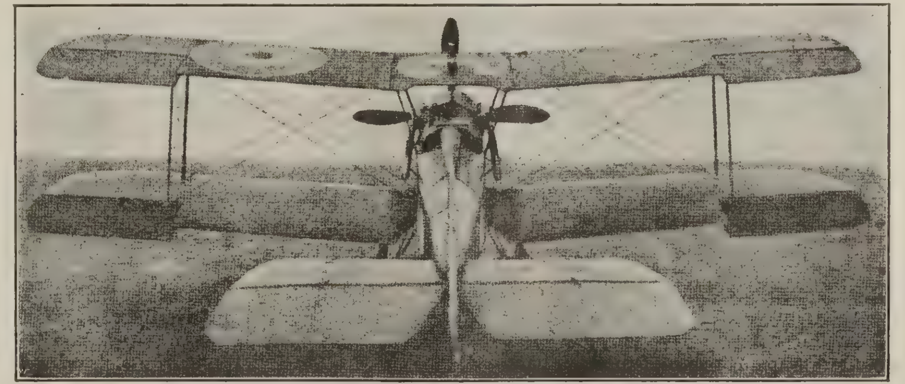
The fuel weight amounts with fully loaded tanks to 111 kilos, so that the total useful load can be calculated at 250 kilos, the total weight working thus out at 956 kilos:

The load of the planes is thus: $\frac{956}{22.8}$

= 42 kilos per square metre.

The performance load is then: $\frac{956}{200}$

= 4.78 kilos per horse-power.



Rear view of the British S. E. biplane

Lieut. Fonch Credited with 49 Huns

Paris.—Lieutenant Rene Fonch is now credited officially with having brought down forty-nine German machines.

Aero Mail Service Improves

Washington.—A reduction in the delays in the aero mail service between Washington and New York, is shown in a report of the Post Office Department, issued on June 30th.

Out of twenty-four flights to New York since June 1, the mail arrived on thirteen days before 3 P. M. Nine trips were finished before 4 P. M. and only twice was the mail later than 4 P. M. in arriving.

Canadian Aero Mail Started

An aero mail service between Toronto and Montreal, Canada, was inaugurated the week commencing June 24th, when fliers from the Royal Air Force left Toronto for Montreal with about one hundred pounds of mail matter. It is expected that other routes will be started in the near future. The flying time between Toronto and Montreal will be about three hours.

Assigned to "Archies"

According to Special Order No. 143 issued at Washington the following officers are assigned to anti-aircraft batteries: Capts. J. H. Babbitt, H. F. Grimm, D. I. Piper, Lieut. G. A. Wilson and 2nd Lieuts. L. J. Buck, J. V. Collis, E. P. Jolls.

Representative La Guardia, now a Captain in the American aviation force operating in Italy, cabled Representative Siegel, of New York, that he expected to be back in Washington by the first of October.

Aeroplane for Artillery Co-operation

Camp Dix, Wrightstown, N. J.—The camp's first aeroplanes have arrived and will be put to use at once. One has been assigned to a Signal Corps company and will be equipped with wireless and used in the artillery manoeuvres.

Personal Pars

Frank A. Hayes has been promoted to the position of chief engineer of the aircraft division of Willys-Overland, Ltd., Toronto, Canada. He joined the organization last year, and prior to that was associated with the Cadillac Motor Car Co.

T. E. A. Barthel, formerly general manager of the King Motor Car Co., Detroit, has become associated with the Curtiss Aeroplane & Motor Corp., Buffalo, and his duties will have to do with the finances of the corporation.

STEEL TUBES, TUBE MANIPULATION, AND TUBULAR STRUCTURES FOR AIRCRAFT*

By W. W. HACKETT and A. G. HACKETT, of Oldbury, Birmingham

(Continued from June 24th issue)

Tubular Joints in Aircraft Construction

Generally speaking, structural work for aircraft purposes is to-day carried out by means of sockets placed in suitable positions and arranged to receive the ends of the various tubular cross-members and bracings. These tubes and sockets are connected in three or four ways—namely, by brazing, by silver-soldering, and by soft-soldering.

Sometimes the sockets or lugs are dispensed with, in which case the cross-tubes are mitred and welded direct to the main tube.

The latter method is not advisable except in very rare instances, as any operation involving great heat is dangerous, owing to the weakening which results from the annealing or perhaps burning of the steel.

Another method is sometimes employed in which the cross-bracings are connected by means of a hinge joint to a sleeve on the main tube.

It will be useful to give the results of some comparative tests made on these various methods of jointing tubular structures, but before doing so we would remark that, in a paper like this, only the fringe of the subject can be touched. Everyone who is in any way connected with the practical side of aeronautical construction will readily call to mind many other types of joints, each designed for a special purpose or to overcome a constructional difficulty.

Speaking from an experience of at least eight years, in which we have been in touch with aircraft construction and design, we have met with a surprising amount of fluctuation in the respective popularity of soldering, brazing, welding, etc., for steel tube work, all these methods having been ruled out in turn only again to find favor in certain quarters. This is partly due to the fact that machines designed by private manufacturers have been brought into great popularity and the methods and designs of such makers adopted.

We have seen welding carried almost to excess and then almost abolished. Brazing has been boomed and then decried, and soft-soldering substituted for it—with a different type of lug or joint to allow for the rescued strength of the flux. This again has been deemed unsafe, and silver-soldering, or hard-soldering, has risen into prominence, and to-day one hardly knows which type really is the popular one, as on the machines now being built for war purposes all styles and types of jointing may be found.

One has to realize that in all these methods the human element comes much into play. For instance, it is possible so to weld a joint that it appears to be sound, yet it may be a "fake"—metal being merely laid on and not fused with the surrounding parts. Or, again, the welded joint may be burnt, thus causing a dangerous weakening.

Similarly with brazing, it is possible with care to make a fine type of joint, but the probability is that in a certain percentage of cases overheating will take place and failure result.

We will now deal with the results of a few experiments recently carried out on certain of these types of joints.

Soft-Soldered Joints

Let us take soft-soldering first. In all cases the tests were made with a soft-solder composed of 60 per cent. tin and 40 per cent. lead—using "Fluxite" or some similar article as a flux.

Tubes of various gauges were tried, but up to a certain point the strength of the soldered joint was such that the tube failed in tension without the joint giving way.

The strength of a soldered joint is much greater than it is generally supposed to be, and from experiments carried out, the clearance or thickness of the soldering material does not, between the limits of .001 in. and .008 in., make much difference, but for any components that can be guaranteed to size we would recommend as "thin" a joint as possible.

A striking example of a strong joint of the type just referred to was then given. The test on this joint was carried out in order to prove to the satisfaction of inspectors that the stipulated minimum clearance of .005 in. on the diameter was not necessary. In this particular case the elevator lever was held stationary while a torsional load was exerted on the tube. The result speaks for itself.

One of the chief arguments against the use of soft solder is the reduction in strength resulting from vibration, it being claimed that this form of joint will not sustain a vibratory load nor a series of shocks. This may sometimes be right, but even under these conditions a very satisfactory result can be obtained if the sweating is done thoroughly and well, and added strength is given if the joint be "pegged."

Tests on Soldered Joints

The writer recently carried out some experiments on what may be termed a "Tup-testing machine" for soldered and brazed joints. The rising and falling tup is actuated by a bell crank lever, worked by a "sudden-drop" cam rotating in the direction of the arrow. The dead load on the tup shaft can be varied by means of the sliding weight.

A standard drop of 4 ins. was arranged for, and the method of making the test piece is shown by the enlarged section.

It was at first thought that the effect of the "tup" action would be to quickly rupture the joint, but to our great surprise the joint held to such an extent that we found it necessary during the test to increase the load from 10 lbs. to 24 lbs. The following are the details of the test:

Size of tube: 1 in. o/d. by 18-gauge.
Depth in socket (or lap): ½ in.
Thickness of solder: .005 in.
Number of blows: 113,500 with 10 lb. weight tup.

Further number of blows: 64,000 with 24-lb. weight tup.

At this stage the joint showed signs of giving way, so it was decided to apply a tensile test to see if the repeated blows had in any way deteriorated the solder. To our surprise the tube did not pull out until a load of 5.2 tons had been registered, giving the excellent result of 3.31 tons per super inch on the solder lining.

As regards the general results of soldering, the following list of tests will give a good idea of the strength attainable under proper care and supervision.

It may be urged that these results are not a fair basis on which to reckon, as they do not represent the ordinary work of the average operative. In answer, we would say that these results were all obtained from test pieces sweated by different operatives, in some cases being the work of girls with about two monthe' experience.

It may be possible to work out a formula to arrive at a basis for designers of soft-soldered joints, but even here, as in all calculations relating to structures, other factors have to be taken into account. For instance, a joint may be quite strong enough if in a 1-in. by 20-gauge tubular joint the solder reaches to a distance of ½ in., and working on this basis it follows that the same distance for a 2-in. diameter tube of the same gauge would be correct, but no one would be satisfied with this, and would naturally double the length of socket to meet the increased diameter.

Generally speaking, it may be taken for granted that with ordinary care, and with a good quality of soft solder, a joint can always be made to withstand a shearing stress of 2½ tons per super inch on the solder itself—provided (and this is the crux of the whole matter) that the articles are well tinned and cleaned prior to the operation of sweating.

As regards the apparatus for sweating, different people will have a different choice, but having tried soldering irons, blow-lamps, coal-gas jets, and hydrogen flame, we have found that the three latter are about equal, and each is better than a soldering iron alone, but this latter is necessary for finishing in awkward corners. Eventually the use of a simple electrical device will probably become popular for repetition work.

Brazing

As previously mentioned, this means of connection still has many adherents. There is, however, a great disadvantage attached to it, viz., the risk of burning the tube owing to the intense heat necessary. That this burning and consequent weakening does take place can be easily shown by the results of tests carried out by us on a cantilever testing machine.

The tests were upon tubes which had been fixed into sockets and brazed or soft-soldered.

Another point may be mentioned with regard to these tests. In one case the joint was "faked," the tube and socket being left dirty and improperly tinned in consequence of which the soldered joint had no "life." Even under these conditions the joint held for 75,130 revolutions, as against about 4,000 for the brazed joint. At this point the socket failed, due to the insecure fixing of the tube.

Another peculiar feature of this test was the heat generated in the brazed tubes due to the constant working of the molecules. The tubes commenced to warm up almost immediately, and before they broke the temperature of the tubes near to the points of fracture (*i. e.*, near the socket) was about 120 deg. C, sufficient to cause the charring of any adjacent wood, whereas the soldered tubes remained quite cool until the last few minutes prior to fracture.

We are quite aware that in many places on aircraft structures brazing is permissible and good, but where any weakening of a member is likely to cause disaster brazing should be carefully avoided.

Silver-Soldering or Hard-Soldering

The foregoing remarks as to brazing hardly apply to silver-soldering, as by this method a strong joint can be obtained without undue heat. We are not in a position at the moment to give any comparative figures of tests, but we should say that from the standpoint of tensile strength, silver-soldering is higher than soft-soldering, and very near to that of brazing. The heat necessary to perform the operation is lower than for brazing. The heat necessary to perform the operation is lower than for brazing, and is not likely to weaken any members if reasonable care is used. It is, however, a longer process, and the material used is very costly.

Welding

We may well ask ourselves in these days where we should be without some form of autogenous welding. The thousand and one articles that are built up of sheet metal welded together speak for themselves, and make us wonder how we ever got on without this useful engineering process.

Still, welding has its limits of usefulness, and if exceeded danger may be near.

In the early days of aeronautical engineering welding was often used in places and on parts where to-day it is "taboo," and such a method as welding tube to tube has dropped to a great extent out of favor, having been superseded by the more costly but beter and safer engineering practice of jointing by means of machined or built-up tubular sockets, previously referred to.

Welding—by whatever means it is done—is always open to a certain amount of doubt, and though there are innumerable cases where this doubt as to the strength of a joint is well covered for, yet, owing to the hidden nature of the defects of welding and the possiblity of burning and oxydisation, present-day designers avoid it in any important member of an aircraft structure.

A most important rule introduced during recent years has been the suitable annealing of welded joints, and this rule should be adhered to whenever possible. Many will have noticed the brittleness of a welded joint before annealing or normalizing, and the malleability of the same afterwards.

On this point the writers have discovered within the last few months a rather strange fact. We had occasion recently to make up some small lugs, from which it will be seen that a certain amount of shortening took place as the result of the welding on of the arm. We have since noticed this hortening in other tubes, some of quite considerable length, where various fittings have been welded on at intervals, and so far we have not arrived at a satisfactory explanation.

For the sake of any who may not have been able to carry out their own tests on welded joints, it may be helpful if we here give the results of some experiments we have made.

The easiest method of welding is the butt joint—*i. e.*, when two tubes are placed end to end and joined together to form one length or mitred together form one piece. In such a case the surfaces to be welded are readily accessible, and the flame has freedom for doing its work.

A more difficult type of welding is that necessary when one tube has to be mitred to the outside of another tube, as when forming a "T" lug. In this case the easily melted end of the one tube has to be united to the outside surface of the other, and anyone who has had experience with welding will know how much more difficult it is to attack the hard outside skin of a tube or sheet than it is the edge.

In order to prove this point we carried out tests on tubes measuring 1 in. outside diameter by 20-gauge and 1 in. outside diameter by 16-gauge—some being butt-welded and others having an interposed tube of about the same diameter, to which the end of each tube was welded.

Comparative tests were made on a cantilever tube joined to the main member by welding, and a similar type of loading was also tested for a lug, with the tube fixed in place by welding.

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*Paper read before the Aeronautical Society on May 2, 1918.

The following were the results:

Welded direct to tube..........	335 lbs
Welded into socket	365 “

Welding is often harshly criticised as regards its ability to withstand vibration, but even in this respect we have found striking instances where the tube has broken before the joint.

Some time ago we tried an intermittent shock and vibratory test on a machine. This machine gave a series of vibrations to the tube, the blows due to the "peg-cam" being 1,400 per minute. In some cases the tube broke off without the welded joint suffering in any appreciable manner.

As regards welding of any description to be done on tubing, we do not advocate the use of tubing made from steel too high in carbon. A low carbon steel gives the better result, and it is also most essential that the phosphorus content of both tube and welding wire shall be low.

Wherever possible we would suggest that the welding on of hinges and sockets to a main spar or post be avoided. To slot a tube or soften it by welding is unwise, and in place of any fixtures that at present demand such operations we recommend a sweated and pegged fitting.

Some experiments were carried out by our company in order to convince some of our friends of the advisability of following the course we have suggested. In one case it will be seen that a wiring lug is fixed on a main spar by welding, and in the other by sweating and pegging. Alternating tests on these tubes gave the following results:

Welded	5,190 revs.
Soldered	8,800 “

Rust Prevention

One further point remains to be mentioned. It is well known that a long life for any modern aeroplane is not expected. The present necessary wastage in aircraft is such that the question of internal rust and corrosion of the steel work is not of serious moment. The time is coming, however, when such matters will have to be seriously considered. For any post-war machines—especially if designed for general passenger traffic—the question of the length of life of all parts will be one of primary importance. Many experiments have been carried out in this country with this end in view, but nothing definite has been reached.

We have experimented with two or three methods of preserving from rust and corrosion, with fairly satisfactory results, and in the case of airship framework, subject as it is to salt-water influence, we have used with fair success the "cosletising" process.

For soldered work, such as rudder and fin frames, we have instituted at our works a thorough system of washing and brushing in hot soda water to remove all traces of the fluxite or the flux, and we think this is most essential.

In conclusion, we would say that "the last word" in tubes and tubular structures has not by any means yet been spoken. With the increase in the size of machines, the constant and ever-increasing shortage of seasoned timber, the extended use of machines in future years in hot climates, with all the climatic effects on timber, the "all-steel" machine will undoubtedly soon quently the subject of tubes and tubular construction assumes increasing importance. We all have much to learn on this subject, and we trust that this paper will prove of mutual benefit and help forward in some way the science of aeronautics and the good of the community at large.

Discussion

Captain Philpott said the subject of the paper was one of which they wanted to know a good deal. He was extremely interested in Mr. Hackett's remarks about the nickel chrome hardened tubes, which became brittle when subjected to pickling in acid. Did the authors get any explanation why that occurred? He had tried to trace the cause of that trouble and made one or two tests, and it seemed likely that the trouble was due to hydrogen getting into the steel during the pickling process. In trying to get some evidence in support of some rich proposition, a number of pieces of steel were inserted in hydrochloric acid, and afterwards the pieces of steel were boiled in water, above which gas collected which exploded when flame was applied to it. Had the authors tried to solve the question why nickel-chrome steel was rendered brittle by pickling? With regard to the double tube—one tube inside the other—which was tested, he believed it was a fatigue test—*i. e.*, the rotary volar test. It looked as though the test piece might act similarly to carriage springs, which were subjected to an alternation of stresses during their life and lasted a long time. Before feeling that that was satisfactory he would like to see how the stress was calculated. It was not easy to calculate the stress of one tube inside another when it was subjected to a bending operation. An assumption must be made of the pressures between one tube and the other. He would have felt happier in discussing the other tests if he had seen the results beforehand.

Captain Smith said Mr. Hackett suggested that the reduction of mild steel tubes was about 1½-gauge per draw, and the reduction of the nickel chrome steel about half that. The difference in gauge varied as the actual gauge thickness. Was that reduction considered as an average value, or was that taken irrespective of the gauge to be reduced? The figures of the alternating stress tests appeared to show that there was a small amount of torsional breakage. It appeared to him that there was a certain amount of torsional stress set up during the revolution of the specimen, which might be due to a certain amount of lag of the load. He thought Mr. Hackett suggested that the cold drawing hardened the outside more than the inside of the tube. In his opinion that had been well shown in connection with the cold drawing of a mild steel bar. An important point which was clearly shown was the fact of the distinction between the brazed and the soft-soldered joints. Those experiments were worth while developing, and if the results arrived at with them were true it was a big point which should be watched.

Mr. C. W. Meredith said the difficulty in using soft-soldered joints was that the outside diameter of the tube was not uniform. A lug made up from a turned forging varied up to 1/64-in. diameter. Of course, that might not apply to all manufacturers of steel tubes, but the outside diameter varied so much that it made it very difficult to soft-solder. One usually asked a man to braze a joint because one had more confidence in brazing.

Second Lieutenant Shaw said a point of interest in connection with tubes was that that more care should be given to the selection of material. While two materials might give exactly identical strength-over-weight values, one material might be denser than the other, in which case the discerning engineering would employ the denser material rather than the lighter, because it would have a smaller surface and take up less room.

Mr. G. I. Price said he was very interested in the samples of bent tubes shown. Could the authors give any information concerning the right means of determining the line that existed between the inner and outer radius of a bent tube that did not change in length during the bending process? The thickening of the inside of the bend was presumably equal to the thinning of the outside. He believed that sort of thing was generally left to the practical operators in the shops, but it seemed to him that it must be possible to determine the position of that neutral axis. Was there a right method of doing so?

The chairman said the authors gave one analysis for nickel chrome steel, but did not give any details as to the care and trouble taken in altering the annealing temperatures to meet the various analysis. No details were given as to the temperatures and times in the heat treatment. The question of suitable filling for bending was mentioned. It would be very valuable, especially for aircraft constructors, to have details in regard to that, because they often attempted to bend the tubes themselves, and they did not always succeed. He asked both these questions for the benefit of the user rather than from the manufacturer's point of view. One thing that struck him very much was the ingenuity and the multiplicity of the testing machines that had been used, and the amount of "meat"—if he might use the expression—in the tests results obtained was something colossal. He knew what it meant to produce such an enormous number of figures as had been produced by the authors, who had given a large number of comparative tests of tubes, and tubes in fittings. He would like to know whether those tests were made with pieces of tube all cut up the same length or lengths of tube all made at the same time with the same analysis, and so forth. No doubt the figures were valuable, but he would like to see some of those tests correlated with analysis figures and with the usual test results that were included in the ordinary specifications. With regard to welding, he was glad such strong expressions of opinion had been put forward by the authors on that subject, as it was one of the most difficult they had to face. He always had cold feet when he had to look at a weld. Had the authors had any special difficulty in regard to welding, and what precautions did they take with alloy steels? They mentioned that low-carbon steel and straight-carbon steel was preferable. He would like to know their experience with high nickels, high chrome, low nickel, medium nickel chrome and medium carbons.

Reply

Mr. W. W. Hackett said, in reference to Captain Philpott's remarks regarding the effect of the pickling on chrome nickel tubes that had hardened, his explanation coincided with theirs (the authors). He asked everyone to avoid it. That was what they were out to warn people against.

Captain Philpott also asked, in regard to laminated tubes, how the stresses were worked out. They took the strength of two tubes 32/1,000-in. thick, which was equal to one tube of 64/1,000. They took one tube 32/1,000 thick and drew it down to another of 32/1,000 thick and tested it against a tube of 64/1,000. He thought that gave the same results as regarded its weight.

Captain Smith asked how the reduction of gauge was reckoned. They went from 10-gauge to betwen 11- and 12-gauge in the particular case mentioned. The gauges came down roughly in steps as follows:

22 gauges...............	28/1,000 thick
21 gauges...............	32/1,000 “
20 gauges...............	36/1,000 “
19 gauges...............	40/1,000 “

Then they jumped in eight:

18 gauges..............	48/1,000 thick
17 gauges...............	56/1,000 “
16 gauges...............	64/1,000 “

Then they jumped to twelves and sixteens, and by that method one did not get far wrong. It was a fairly good rule to give a gauge and a half per draw to ordinary mild steel tubes, and half that to chrome nickel tubes. This might be thought to indicate that the chrome nickel tube was stronger, as it stood the pull with less reduction, but they had had a lot of trouble through trying that theory. Someone said in regard to soft-soldering there was a variation of 1/64 in the size of the tubes. There should not be. All his company was expected to allow was a plus of .004 and minus nothing. If they were to get 1/64 it would be about twelve times too much, and he would certainly complain. A question was asked about the length of tube that was going to be bent. By measuring round the neutral axis—the middle of the tube—one got practically the length taken for bending. In the illustration he gave of the bent tube he gave figures which he thought showed that it had thinned on the one side practically as much as it had thickened on the other side. By going right round the middle of the tube to find out the amount required one did not get far wrong.

Lieutenant-Colonel Bagnall-Wild asked about the annealing temperatures. For the mild steel the temperature was 650° to 750°. It was best either to go above those temperatures or keep under them in the working. The safest way, as a rule, was to keep under. They got a more uniform result before the last drawing, and if a temperature of about 850° was got by close annealing that was the temperature of the tube. The period must be according to the thickness of the tube. Take 18-gauge—about normal thickness—that was given about 25 minutes, 10-gauge 40 to 45 minutes, and 20-gauge 15 to 20 minutes. Various things were used for filling before bending. Lead was one and resin another, but resin should always be used in a fireproof building. It was one the easiest and cheapest things to bend with, but there would be trouble unless it were done in a proper building. If filling were not used a special mandrel must be made, which was very expensive. The test pieces described were on every occasion taken off the same piece of tube. They (the authors) had not set out to prove a theory, but to let the test pieces prove the case. A length of tube was cut up and the pieces to test were taken in a fair and reliable way. If anyone would like the tests carried out again it might be worth while, and they were quite willing to go on and take any test the members of the society wished them to take. With regard to the tensile testing, each batch of tubes had a number of tests carried out by means of tensile testing, flattening and crushing. The crushing tests used were some of those taken from the Aircraft Inspection Department. With the heat treatment given at their works they got not more than ½ per cent. of rejections from any causes. He thought the correlation of their tests with the tensile tests one got in the normal work was given in some of the charts. On all the charts the tensile tests and elongation were given.

Mr. A. G. Hackett said, in regard to Captain Smith's question, there was very little torsion effect on the alternating machine. When the machine was in operation the tube was practically in alignment with the machine spindle. It it were carried round by the torsion effort it would carry out of line. Sometimes it wobbled, and they had to rush to stop it. By putting the weights on too quickly and setting up vibration harm was apt to be done without proving anything. The case put forward by Mr. Harold Smith presented no difficulty. The bending of two pipes which had been shown on the screen, and which were streamline tubing 2 in. by 1 in., or probably more, gave very little difficulty when proper tools were used. They had now in hand the bending of a 6-in. by 2½-in. tube, streamlined on the flat. In ordering tubes for bends it was usual to allow a little over and cut to the right size after bending, otherwise one would not get the accuracy the A.I.D. expected. No doubt many of those present had found, as he had done, that in trying to bend annealed tubing, say 1 in., 20 or 22 gauges, it puckered. It was better to bend it in a slightly harder condition and anneal it down afterwards. It was impossible to bend it properly if it had been annealed too far. That point should be brought more in front of contractors who had to deal with tubular bends. With regard to the point raised by the chairman as to filling for bending, with a close-wound spring of suitable strength a small bend could be got, and to avoid any chance of buckling or breaking the spring could be twisted in and twisted out again, and good results could be obtained. But for anything past a certain angle it was not a practical proposition.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
FLA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Dallas, Tex.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Finance Manager, Aircraft Production, 870 Woodward Bldg., Detroit, Mich.

Note 3—Report to Col. J. G. Vincent, Mutual Bldg., Dayton, Ohio.

Note 4—Report to Swissville, Pa.

Note 5—Report to District Manager of Equipment, Chicago, Ill.

Note 6—Report to Major Hall, Dayton, Ohio.

Note 7—Report to District Manager of Production, 1836 Euclid Ave., Cleveland, Ohio.

Note 8—Report to Sturtevant Aeroplane Corporation, Boston, Mass.

Note 9—Report to Capt F. C. Bahr, Springwells, Detroit, Mich.

Note 10—Report to District Manager of Equipment, Buffalo, N. Y.

Note 11—Report to War Prison Barracks, No. 2, Fort Oglethorpe, Ga.

Note 12—Report to O. i/c Production Bureau Aircraft Production, Dayton, Ohio.

Note 13—Report to Radio School, University of Texas, Austin, Texas.

Note 14—Report to Finance Dept., Packard Motor Car Co., Detroit, Mich.

Note 15—Report to Camp Alfred Vail, Little Silver, N. J.

Note 16—Report to Capt. M. H. Grace, 480 Lexington Ave., New York City.

Note 17—Report to Fort Kamehameha, Honolulu, Hawaii.

Note 18—Report to Capt. P. B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 19—Report to District Manager of Equipment, 870 Woodward Ave., Detroit, Mich.

Note 20—Report to Edgewood Arsenal, Edgewood, Md.

Note 21—Report to Cooperstown, N. Y., and wire D. M. A.

Special Orders Nos. 135 to 141, Inclusive

A

Allen, Graff	FRF
Anderson, Milton Stanton	SLR; EOT
Apelt, Carl P	SLR; AAD
Abernathy, Claude S	DIK
Albright, John Wilson	SLR; PMT
Addington, Edward P	LHV
Andrews, Searle Earnhart	SLR; RWT
Allen, George E	EOT
Archer, Cecil E	PWM
Aubuchon, Joseph M	WFO
Ammell, Roy W	WFO
Avera, John W	WFO
Arnold, Leslie P	TFT
Alexandre, James H	SLR; DMA
Austin, Harold Russell	SLR; FOB
Allen, Morton P	SBI
Allen, Albert A	TFT
Ayers, Verne U	CAF
Arnold, George M	TFT
Arnold, Ivan Thomas	SLR; PMT
Allen, Leon Byron	SLR; Note 4
Adams, Lawrence Russell	SLR; Note 5

B

Buchanan, Thomas Shirley	SLR; PMT
Baker, Edwin D	FRF
Brush, Oliver G	DIK
Bartholf, John C. P	MAC
Brown, Clinton Giddings	CPR; DMA
Booker, John Marshall	SLR; MAT
Baildon, John K	FRF
Blackburn, Lloyd C	FRF
Bartlett, Treffley P	FRF
Brewer, Scott R	FRF
Barrett, Clement J	DMA
Baldwin, Robert Caleb	CPR; DMA
Balkman, Herbert H	FRF
Braymen, Kenneth Currie	SLR; KST
Bradley, Timothy Whitelaw	SLR; RWT
Breese, Clinton S	SLR; DIK
Bell, Alonzo E	EOT
Breckon, Leslie S	PFO
Burge, Kemp S	LHV
Biersdorf, Frederick W	PWM
Buser, Albert E	PFO
Barr, George D	EOT
Bell, Charles Frank	SLR
Belt, William S	SLR; AAD
Brainerd, Walter Melville	SLR; KST
Buckland, William Eaton	SLR; RWT
Burrows, Frank Herbert	SLR; EOT
Brackett, Roy	VBW
Bates, John H	WFO
Brants, Harry E	WFO
Berrien, Chauncey Leonard	SLR; DAP
Beck, Vernon S	SLR; PMT
Baker, Robert H	WFO
Blackmer, Lawrence M	WFO
Bruch, Russell L	WFO
Bailey, Louis C	WFO
Brodrick, William J. H	WFO
Barnes, Dwight F	WFO
Booth, Harold W	WFO

Burnet, Gilbert W.......................WFO
Backus, Charles F.......................FRF
Bailey, James R.......................WFO
Bidwell, Robinson E.......................WFO
Birmingham, William J.......................CIT
Bailey, James R.......................FRF
Bartlett, Charles Owen.............SLR; PFO
Bishop, Albert Bentley.............SLR; PFO
Blynn, Lloyd Ross.............FLT; VEW
Backus, Charles F., Jr.............SLR; AAD
Britton, Ralph Royal.............SLR; ELA
Batty, John Hereford.............SLR; AAD
Blake, Joseph F.......................CAF
Buell, Maurice L.......................CAF
Budd, Dennison M.......................DIK
Barrett, James R.......................WFO
Barnard, George A.......................TFT
Browning, Russell I.......................TFT
Blanchard, Carleton W.......................WFO
Blum, Clarence A.......................TFT
Bennett, Horace R.......................TFT
Bateman, George L.......................TFT
Biggs, Frederick P.......................TFT
Bramlette, James L.......................WFO
Barrett, Philip A.......................TFT
Bird, Emerson Prall.............SLR; RWT
Baskerville, Ralph Edwin.............SLR; CGC
Bernard, Clifford Shaffer.............SLR; LDT
Brannum, Claude Joseph.............SLR; RSD
Bassett, Bert Van Cickle;..;.....FLR; Note 6
Ball, Leland Herbert.............SLR; Note 7
Baird, John Leith.............SLR; Note 4

C

Cummings, Frank J.......................WFO
Clauss, Albert F.......................WFO
Camblin, Roy W.......................DIK
Churchill, George Everett.............SLR; RSD
Campbell, Robert A.............FLT; DIK
Campbell, Walter M.......................WFO
Callis, Louis Emmanuel.............SLR; TFT
Carroll, Alfred B.............FRF; TFT
Cainon, Cutler J.......................VEW
Case, Ira M.......................BFT
Caskey, Lorne Lane.............SLR; CGC
Cattermole, Edward Lowell.............SLR; CGC
Cecil, Harlan E.............SLR; CGC
Chalfont, Harvey Odell.............SLR; AAD
Cornell, George C.............SLR; AAD
Clarke, Horace.......................DIK
Currie, Edward William.............SLR; RWT
Cox, Charles Benjamin.............CPR; DAP
Christian, Ben.............SLR; RSD
Chester, Andrew E.............SLR; AAD
Couberly, Lawrence B.............SLR; AAD
Clark, Willard Shaw.............SLR; LDT
Craig, Howard Arnold.............SLR; CGC
Curran, James M.......................FRF
Coulton, George.............SLR; CWT
Childress, Charles William, Jr.......SLR; KST
Cary, Edward A.......................CAF
Coleman, Arthur A.......................PWM
Chauncey, Charles C.......................CAF
Chaddock, Homer L.......................PWM
Chance, Percival N.......................PWM
Cooper, Lane R.......................PWM
Cone, Charles L.......................PFO
Clark, Arthur French.............SLR; RSD
Cole, Harold Lester.............SLR; RSD
Collier, Henry Latimere.............SLR; AAD
Collins, Claude Raymond.............SLR; AAD
Compton, Howard.............SLR; AAD
Colthart, Robert L.......................VEW
Clark, Smith D.......................WFO
Collins, Raymond D.......................WFO
Crawford, Frank H.......................WFO
Camaron, David.......................WFO
Cole, Dausa W.......................WFO
Caldwell, Jabin R.......................WFO
Cline, Harold V.......................WFO
Case, Kenneth B.......................FOB
Chapman, Harold Culver.............SLR; LDT
Carter, Edward Vivian.............SLR; RSD
Craig, William Walter.............SLR; AAD
Chaplin, Winthrop Lancelot........SRL; LDT
Creshore, John Davenport.............SLR; EOT
Cleveland, Waldo Atwood.............SLR; LDT
Cathcart, Donald Guthrie.............SLR; FOB
Carroll, Thomas J.......................KST
Cohen, John.............SLR; EOT
Charroin, Arthur Buron.............SLR; KST
Cunningham, Samuel Davis.............SLR; RSD
Coningsby, Alfred R.......................CRI
Coons, Gerald F.......................CRI
Cox, Artie G.......................WFO
Craigie, Karl H.......................WFO
Clunk, Roy T.......................CRI
Cole, Charles C.......................TFT
Canfield, Donald Treat.............SLR; PFO
Case, Leland I.......................TFT
Carrington, George D.......................SMM
Calef, Robert C.......................TFT
Carroll, William F.......................CAF
Cann, Frederick Bowman.............SLR; KST
Coyle, Frank J.......................Note 17
Costello, John Vincent.............CPR; Note 3
Caulfield, Sydney W.......................DAP
Cunningham, Robert Howe........FLR; Note 2

D

Daniels, Julian S.............SLR; AAD
Dreyfuss, Albert M.......................FRF
Dixon, Thomas D.......................MAC
Dimond, Frank Joseph.............SLR; CGC
Dorland, Chester D.......................JMA
Delashmutt, Harry A.......................DIK
Daniel, Lloyd A.......................DIK
Dunn, William S.......................VEW
Dorris, William L., Jr.......................DIK
Davis, John W.......................FRF
Doherty, Chester Cochran.............SLR; KST
Dixon, Edward M.......................PFO
Dorian, Frank E.......................CAF
Davidson, Carleton Fred.............SLR; PMT
Dickey, Edward K.......................EOT
Dyche, Justin K.......................PFO
Doty, David E.......................LHV
Duncan, John C.............SLR; FRF; PMT
David, Edwin K.......................WFO
Daniels, William C.......................WFO
Doolittle, James H.......................WFO
Duke, John Flavel Slaughter.............SLR; KST
Duke, Daniel Fitzgerald.............SLR; EOT
Dewey, Robert A.......................WFO
Dana, Deane.......................WFO
Daley, Walter F.......................WFO
Davis, Kenneth M.......................WFO
Drath, Louis Herman.............SLR; KST
DeLashmutt, Harry Algern.............SLR; LDT
Dick-Peddie, William S.......................SBI
Darlington, Frank.......................TFT
Donalds, John E.......................TFT
Dvorak, Leon E.......................DIK
DeVore, Kenneth L.......................WFO
Donnelly, Clarence E.......................WFO
Daniell, Sidney S.............FLT; DIK
Duncan, Floyd R.......................TFT
Dietrich, Richard H.......................WFO
Dallas, Burnie R.......................WFO
Duryea, Leslie N.......................TFT
Drake, Chester Myrick.............SLR; LDT
Dorner, Earl Victor.............SLR; KST
Dougherty, Elmer Lloyd.............SLR; KST
Dayton, Paul Kuykendall.......................DAP
Deas, Archibald Swinton.........SLR; Note 14

E

Evleth, Earl Mansfield.............SLR; CWT
Ernst, George Goodman.............SLR; KST
Egbert, Perry T.............SLR; FRF; PMT
Eubank, Eugene L.......................PWM
Elhart, Earl W.......................DIK
Eldridge, Loyal A.......................DIK
Egan, Thomas Martin.............SLR; ELA
Epperson, Arthur R.......................CAF
Erlichman, Ben B.......................PWM
Edson, Albert I.......................EOT
Eyman, Bradford.......................PWM
English, Connell Abdill.............SLR; EOT
Evans, Floyd W.......................EOT
Eichelberger, Raymond R.......................WFO
Elliot, James H.......................WFO
Ebert, Solomon B.......................WFO
Edwards, Carl W.......................TFT
Elliot, Park.............SLR; PFO
Emerson, Alfred G.......................TFT
Eldridge, Loyal Arthur.............SLR; RWT
Erickson, Fridtjof Carl.............SLR; RSD
Erickson, Harold.............SLR; RSD
Edmonds, Percy John.............SLR; Note 8

F

Fowler, William Donald.............SLR; CGC
Fair, Harry C.......................EOT
Fields, Frank E.......................FRF
Frazier, Edward J.......................SMM
Finn, Matthew E.......................DIK
Fall, Harold A.............SLR; AAD
Frazer, Walter.......................DIK
Francisco, William H.......................FRF
Flinn, Earle F.............SLR; FRF; AAD
Frazer, Douglas Maverick.............SLR; RWT
Flynn, Mortimer G.............EOT; FRF
Fay, George Herbert.............SLR; LDT
Foss, George A.......................CAF
Fidler, Charles F.......................EOT
Frankfort, Frederick.......................PFO
Fowler, Lester A.......................EOT
Foster, William C.......................LHV
Freeman, Charles M.......................PFO
Farrell, John Bryan.............SLR; RSD
Foreman, Carroll Leonard.............SLR; EOT
Fairclough, Richard H.......................WFO
Fulmer, Raymond L.......................FOB
Fritts, Ralph V.......................WFO
Flook, Harry E.......................TFT
Foster, George P., Jr.......................CRI
Fox, Russell R.......................TFT
Frierson, Samuel G.......................TFT
Fraser, Walter.............SLR; LDT
Frink, George Willis.............SLR; LDT

G

Gallup, Burton Augustus.............SLR; ELA
Goodsell, Ogden Maxwell.............SLR; EOT
Gilder, Rodman.....DMA; SRC; WLM; Note 1
Greene, Lew A.......................DIK
Gile, Richard D.......................JMA
Gillett, Robert S.......................SMM
Goldthwaite, Joel A.......................SMM
Graham, Audrey W.............SLR; AAD
Graham, Harland B.......................DIK
Gilman, Max Montirose.............SLR; RWT
George, Marshall Woods.............SLR; TFT
Goodrich, John Delos.............SLR; PFO
Grazier, Oliver Earl.............SLR; RSD
Gardner, Fred Eugene.............SLR; CRI
Ghee, Milton Pomeroy.............SLR; LDT
Graven, Carl Melvin.............SLR; PMT
Garrett, John W.......................LHV
Gowans, John.......................PFO
Green, Dwight Herbert.............SLR; KST
Gendron, Loen P.......................EOT
Gwynn, William S.......................SBI
Griffin, Norval B.......................RWT
Greve, Lyman T.......................KST
Grady, Henry L.............SLT; DIK
Grubb, Kenneth P.......................WFO
Gillet, Charles B.......................FOB
Gilman, Harold A.......................WFO
Groah, Gordon L.............SLR; PMT
Gomes, Russell.......................WFO
Gleerup, William W.......................WFO
Guthier, Roy E.......................WFO
Goddard, Fred C.......................WFO
Goos, Carl N.......................WFO
Garber, Ray O.......................CRI
Gowen, John K., Jr.......................CRI
Graham, Joseph A.......................TFT
Grantham, Harry N.......................DIK
Gilchrist, Hugh Robert.............SLR; CGC

H

Hamilton, Thomas V.......................SMM
Hangan, Alfred J.......................SMM
Howard, Harlan L.......................SMM
Hirsh, Moriss W.......................SMM
Hoffman, Raymond L.......................SMM
Hines, Charles G.............SLR; DAP
Hatherman, John Francis.............SLR; DAP
Haddorff, Carl Loepold.............SLR; RWT
Hayward, Griswold S.......................SRC
Heffner, Roy J.......................DMA
Herslof, Sigurd N.............SLR; FRF; PMT
Hayes, Leslie E.............SLR; AAD
Harbage, Homer B.......................DIK
Healy, Michael V.......................DIK

Transporting partially disabled machines to the rear of the front lines for repairs
(French Official Photo)

Henderson, Charles I	SLR; AAD
Hart, Jabez W	DIK
Holloman, Barrett W	DIK
Hartman, Clarence A	DIK
Hall, George L	DIK
Haines, Frank B	SLR; AAD
Huber, Gilbert Jacob	SLR; CRI
Hajek, William Jennings	SLR; RSD
Heaney, John William	FLR; VBW
Harrison, George R	OSU
Haggerty, Stewart A	FRF
Hawkins, Emin W	SLR; FRF; AAD
Hill, John Parker	FLT; DIK
Howard, Thomas D	FLR; DIK
Hassan, Ali A., Jr	CAF
Hughes, Albert E	SLR; AAD
Harvey, Harold M	LHV
Heyden, Arthur L	EOT
Henry, Percy C., Jr	PWM
Harding, Roy E	PFO
Haywood, Oliver C	FRF; PFO
Hyde, Gordon E	PFO
Houlihan, Daniel J	PWM
Hillix, Albert F	LHV
Hanley, Harold R	EOT
Hale, January R	DIK
Houlton, Raymond Colliver	SLR; EOT
Hughes, Edwin Donald	SLR; CWT
Harvey, Robert Baker	SLR; AAD
Haynes, Grissom Edward	SLR; EOT
Haywood, Chester Benson	SLR; RWT
Hebbard, Charles Bradford	SLR; RSD
Hooper, Harley Lewis	SLR; RSD
Hitchcock, William Charles	SLR; AAD
Henderson, Paul R	FRF
Hayden, Max Ernest	SLR; ELA
Hall, Edwin Philip	SLR; RWT
Harris, Richard F	DMA
Hodgin, Barney R	VEW
Huffman, Charles Ray	SLR; PFO
Hunt, Barton Lee	SLR; PFO
Haines, Charles Henry	SLR; HHN
Hartman, Frederick S	WFO
Holmes, Robert B	WFO
Haddon, Julian B	TFT
Hughes, Francis F	TFT
Haggerty, Lyman H	SLR; AAD
Henderson, Warren	CAF
Hart, John F	WFO
Hager, Daniel I	WFO
Howard, Raymond E	DIK
Hirshfield, Ira W	WFO
Hughes, Joseph V	WFO
Heltzen, Harold H	SBI
Hoffman, Ernest E	SBI
Hanson, Bert J	SLR; CGC
Hinds, Harold W	CAF
Hyde, Jules Verne	SLR; LDT
Hale, January Rowland	SLR; KST
Hungerford, Clarence Ives	SLR; KST
Headley, Mervin Eugene	SLR; EOT
Hartshorne, Frank W. K	TFT
Hill, Edward A	TFT
Hegenberger, Albert F	TFT
Howard, Lynn Frederick	SLR; HHN
Howard, Raymond Edward	SLR; HHN
Henning, William Hugh	SLR; Note 4
Highbie, Carlton Milo	SLR; Note 9
Hubbard, Charles Wells	SLR; Note 10

I

Imhoff, Wallace Garretson	SLR; RWT
Innes, William Wallace	SLR; CWT
Ittner, Harold Darlington	SLR; AAD
Ingraham, Elmer C	SLR; AAD
Isbill, Paul M	WFO
Isom, Walter Lee	SLR; RSD

J

Jones, Vivian M	DIK
Jenkins, Ned W	SLR; AAD
Jewett, Alfred L. M	DIK
Johnston, Neil S	PWM
Johnson, Everett B	PFO
Johnson, Andrew B., Jr	CAF
Jewett, Harold A	CAF
Johnson, George S	PWM
Jones, Ira Milton	SLR; CRI
Junkins, Albert Benton	SLR; PFO
Johnson, Laurence Strean	SLR; TFT
Justice, Philip S	DIK
Johnson, Frank A., Jr	TFT
Jackson, Norris D	TFT
Jones, James S	WFO
Johnstone, Hugh R	WFO
Jordan, James J	WFO
Johnson, Courtlandt S	WFO
Johnson, Bruce	WFO
Jones, Elmer H	WFO
Jewett, Alfred Liljevalch	SLR; LDT
Jones, Howard Hiltz	SLR; LDT
Jonson, John Marvin	REL
Jenninson, John Charles	SLR; LDT
Johnston, Waldo C	Note 21
Jenkins, Nelson D	Note 17
Jones, Raymond W	Note 11

K

Kenny, Franklin R	DMA
Klingensmith, Ward Clifton	SLR; PMT
Killough, Hugh B	TFT; LFV; Note 1
Keniston, Harry Cole	SLR; RWT
Kuhlman, Roy A	FRF
Kalkman, Eugene C	SMM
Kolb, William M	SMM
Klinger, Kenneth P	SMM
Kenney, Cornelius J	DIK
Kennedy, Walter Clay	SLR; RSD
Kelley, Virgil A	FRF
Keig, Alfred J	SLR; AAD
Keith, Arthur Morson	SLR; KST
Kerih, Anthony John	SLR; PFO
Kenney, Irven W	VBW
Kiener, Harry	SLR; RWT
Kohr, Hugo John	SLR; RWT
Kirby, Samuel D	FRF
Knickel, Walter Clayton	SLR; ELA
Kirkpatrick, Richard J	CAF
Kloke, Carl Pattee	SLR; EOT
Kiley, James E	TFT
Keeley, James H., Jr	WFO
Kilburn, George W	WFO
Knoche, Frederick E	WFO
Kavanaugh, Claude	TFT
Kenny, Raymond	WFO
Keys, Arthur A	WFO
Kelly, William Harold	SLR; AAD
Kearney, John Joseph	SLR; KST
Kechane, John Michael	SLR; CGC
Kinney, Charles Lafayette, Jr	SLR; CGC
Kidder, Charles D	Note 12
Kahl, Charles A	Note 13

L

Laughinghouse, Newman Raiford	SLR; RSD
Linn, Howard	CPR; DMA
Lloyd, William Folwell	FLR; DAP
Leeth, Herman Boscom	SLR; CWT
Littlefield, Robert C	FRF
Lyman, Richard S	DIK
Lundeen, Arthur	EOT
Lenihan, Edward Francis	CPR
Lea, Royal B	LHV
Lawson, Oliver M	EOT
Lesley, Hubert	PWM
Lungren, Edgar E	SLR; AAD
Lawson, Harry E	DIK
Lobdell, Warren L	DIK
Lick, Walter E	EOT
Lister, Harold R	DIK
Lowe, Robert Elmer	SLR; PFO
Locher, Edward Orrick	SLR; LDT
Logan, William Lindsey	SLR; ELA
Leib, William Frederick	SLR; KST
Lenoir, Whitman Hill	SLR; PMT
Lund, Paul S	SLR; AAD
Leonard, Charles M	CRI
Lyle, Samuel P	WFO
Lyon, James L	DIK
Leger, John C	WFO
Leighninger, Robert E. H	WFO
Law, Hugo B	TFT
Lawyer, Samuel E	WFO
Lamb, Howard Earle	SLR; LDT
Lawton, Merritt Lynn	SLR; RSD

M

Mooney, Herbert R	SMM
Mohan, Roy J	SLR; AAD
Morrow, William Henry	FLT; VBW
Morris, Charles Galloway	SLR; KST
Maurice, Walter Ballard	FLR; CMV
Mitchell, John P	GLC; TFT; Note 1
Mahon, William L'Estrange	SLR; ELA
Miller, Wyman R	DIK
Morgenthaler, Daniel Carney	SLR; CGC
Mayne, Lester David	SLR; EOT
Moreton, Frederick Albert	SLR; RWT
Morton, Dudley S	DMA
Munchhof, Theodore J	PWM
Morris, John E	DIK
Martin, William Hope	SLR; CGC
Miller, Charles E	SLR; AAD
Maloney, Arthur M	EOT
Mitchell, Donald H	LHV
Milyard, Raymond C	DIK
Mansell, Isaac E	EOT
Murphy, Harry C	PFO
Metzger, Carlisle L	PFO
Miller, George W	SLR; DIK
Muhlenberg, Henry C. K	JMA
Mallory, Louis C	DIK
Mizer, Walter Ritter	SLR; PFO
Miller, Harry Bader	SLR; RSD
Mallory, Louie Clifford	SLR; RWT
Meyer, Raymond Francis	SLR; EOT
Miller, William Francis	SLR; RWT
Mitchell, Eliot Whitney	SLR
Mitchell, William Robert	SLR; AAD
Morris, John Edward	SLR
Mayo, Francis P	DIK
Marsh, George T	KST
Moch, Alfred R	KST
May, Harry P	KST
Malraison, Leon	SBI
Madden, John H	WFO
Muller, August F., Jr	WFO
Metcalf, Manton B., Jr	WFO
Moser, Harry V	WFO
Mahnken, Walter R	VBW
Mader, Luther P	TFT
Maurer, William R	TFT
Martin, Burbon Almer	SLR; KST
Morrow, Dudley A	SLR; CGC
Moss, Malcolm Wilbur	SLR; CGC
Mullaney, John Francis	SLR; CGC
Masters, Harry B	DIK
Miller, Julian F	WFO
Morris, Joseph Theodore	SLR; PFO
Morris, John P	WFO
Miller, Edward A	WFO
Maloney, John P	WFO
Mapes, Donald D	TFT
Milburn, George J	WFO
Maxim, George W	WFO
Moore, David H	WFO
Moran, George S	TFT
Morley, John Edward	CPR; VBW
Malik, Louis	SLR; RWT
Mills, Byron H	UTA;EOT;GLC;DMA:Note 1
Moffett, Paul R	CPR; Note 19
Mitchell, Philip Charles	SLR; Note 4
Manning, Edwin C	FLR; Note 20

Mc

McAleenan, Arthur, Jr	FRF
McClanahan, Marion R	DAP
McNeil, Guy Lewis	SLR: RWT
McDonald, Samuel Floyd	SLR; TFT
McClory, Harry Garrard	SLR; ELA
McCabe, Alfred Stuart	SLR; PMT
McDonald, George C	PWM
McAndrew, Alexander	FLR
McMillan, Neil T	SLR; AAD
McVicker, John B	PFO
McDonough, Edward Frank	SLR; CGC
McConky, Fred W., Jr	SMM
McAuliffe, William F	PWM
McCartney, Harold Graft	SLR
McGoldrick, Francis M	CAF
McLaughlin, John G	WFO
McGowan, Kenneth A	TFT
McEven, Robert R	TFT
McFlin, Bertrand James	SLR: EOT
McKnight, Harold M	Note 17
McDowell, Robert N	Note 17
McGeehan, Junior J	Note 19

French "Avion de Bombardment," with two heavy guns mounted forward.
(French Official Photo)

N

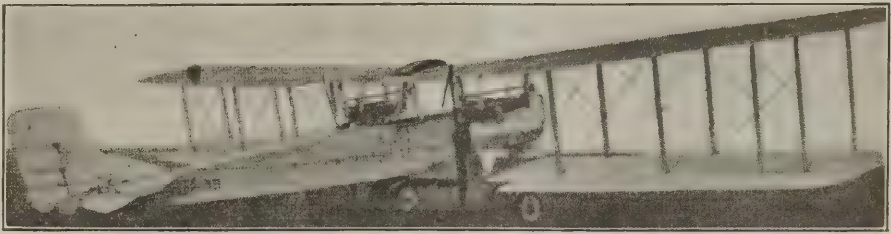
Neff, Lambert G.	FRF
Nutting, Floyd Nester	SLR; MAT
Nordin, Oscar William Emanuel	SLR; PMT
Neely, Eugene Austin	SLR; PMT
Neubauer, George R.	LHV
Nagle, Clarence D.	EOT
Nelson, Luther	PFO
Naugle, Frank S.	PFO
Norris, William R.	SLR; DIK
Nelson, Erik Henning	SLR; EOT
Newbold, Edwin E.	CAF
Nolan, Charles L.	WFO
Newcomb, Walter D.	FOB

O

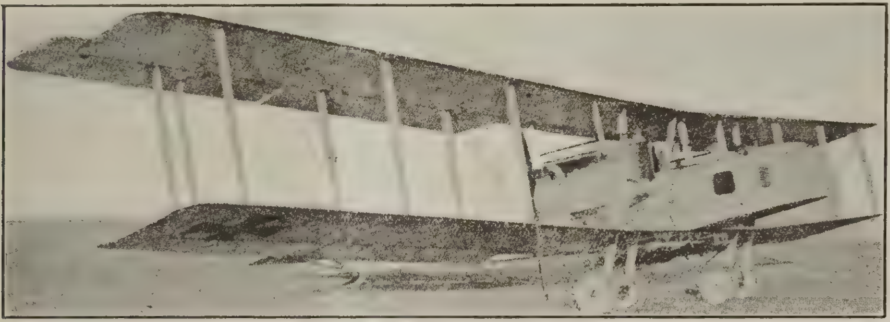
Owen, Ross George	SLR; LOT
O'Hare, Thomas K.	PFO
Olsen, Charles W.	CAF
O'Brien, Robert E.	DMA
O'Brien, John Joseph	FLR; CMV
Olds, Carlton T.	FOB
O'Neil, Joseph H.	WFO
O'Neil, James J.	TFT
Otstot, Robert Edward	SLR; PFO
O'Connell, Francis A.	KST
Ohrstrom, George L.	TFT
O'Brien, Maurice F.	TFT
Overmire, Wilfred Jay	SLR; CGC

P

Pollard, Thomas Glover	SLR; KST
Pidgeon, Phillip J.	SLR; AAD
Pritchard, Chester Earl	SLR; RWT
Perry, William Radcliffe	SLR; DAP
Page, Alexander M.	FLR
Pierce, Hugh M.	SAG
Potter, Duncan McKay	EUT; SLR
Paine, Grosvener Robert	SLR; KST



Three-quarter view of the Gotha "Grossflugzeug." (Courtesy of "Flight")



The first photograph of a complete Gotha "Grossflugzeug," which, it is believed, has been published in this country. (Courtesy of "Flight")

Perkins, George C.	CAF
Pilatsky, Louis	PWM
Patton, Hilton M.	SMM
Pyle, Carl W.	EOT
Pringle, Robert W.	PFO
Pennington, Jerome E.	PWM
Pearson, Lawrence H.	DIK
Penland, Clifford H.	SMM
Prindle, William D.	SMM
Pedler, Harry W.	PWM
Politoski, Edward J.	EOT
Peabody, Howard B.	SBI
Phillips, Lyman, Lumsden	KST; SLR
Pilcher, Rufus J.	WFO
Patterson, Kenneth H.	FOB
Phillips, Charles A.	DIK
Porter, Louis Hamblen	EOT; SLR
Penix, William R.	VBW
Pardy, George W.	WFO
Payne, Walter T.	DIK
Post, Leo F.	MAT
Pemberton, George Herbert	SLR; RWT
Pickup, Christopher V.	FRF
Poulin, John A.	TFT
Perkins, Edward Everett	SLR; PFO
Pyke, Charles L.	TFT
Pearson, Frederick H.	KST
Powell, Edward M.	TFT
Porter, Victor W.	DIK
Pefferle, Leslie George	SLR; CGC
Paige, William J.	WFO
Page, Henry Langford	SLR; LDT
Porter, Oscar Stanley	SLR; KST
Porter, George Harvey	SLR; Note 18
Purdy, Lewis John	FLR; Note 18

Q

Quinlan, Charles Gordon	SLR; RWT
Quick, Franklin P.	FOB

R

Russ, Chester Arthur	SLR; RSD
Rogers, Bruce Allison	SLR; RWT
Roberts, Alton True	FLR; VBW
Ryan, John W.	DIK
Rentfrow, Frank Magnus	SLR; ELA
Rollins, Joseph R.	EOT
Riggs, Robert M.	FRF
Reynolds, Walter S.	PWM
Russell, Ralph C.	DIK
Roberts, Joseph B., Jr.	EOT
Rogers, Henry S.	DIK
Rettig, Wilfred A.	CAF
Ready, James B.	PFO
Rose, Waldo H.	DIK
Reynolds, Lee F.	DIK
Rixey, James B.	CAF
Redin, Roy W.	FRF
Raeder, Elmer W.	FOB
Rauh, Joseph A.	WFO
Reynolds, Nelson Elmer	SLR; CWT
Rose, Gamaliel Sanford	SLR; DAP
Robbins, Lee R.	WFO
Rothfeld, Lawrence	WFO
Rudolph, Jacob H.	CAF
Reed, Joseph L.	KST
Reimann, Benjamin C.	KST
Ryan, Thomas J.	KST
Rolfsen, Einer Louis	SLR; CRI
Reese, Llewellyn John	SLR; EOT
Ryan, John Newman	SLR; HHN
Ryniker, Milton Edwin	SLR; ELA
Reichardt, Chris	FLT; DIK
Rozier, Thomas C.	SLT; DIK
Riggs, Robert M.	TFT
Reed, Paul Spencer	WFO
Reed, Harvey S.	TFT
Rubel, James L.	TFT
Rhine, Mel	DIK
Rossiter, Ednor M.	SLR; RSD
Regan, Harold John	SLR; AAD
Ruggles, Wesley H.	CSO
Russell, Ralph Cagwin	SLR; KST
Reynolds, Leo Francis	SLR; LDT
Rose, Waldo Hussey	SLR; RWT
Ruggles, Wesley Heinsch	SLR
Ruckstell, Glover Edwin	FLR

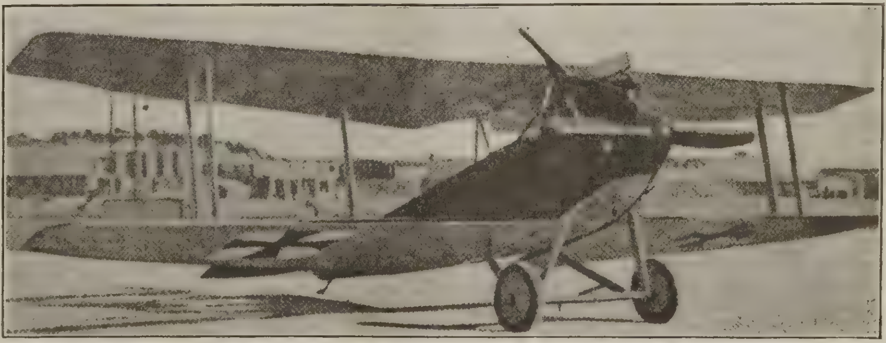
S

Schaf, Joseph C., Jr.	SRC
Simons, Seymour B.	DMA
Senft, Walter Melvin	SLR; RWT
Steedman, Charles R.	DIK
Sypher, George B.	VBW
Stabler, Russel	DIS
Simpson, John Lewis	SLR; EOT
Slater, Joseph M.	DIS
Swanson, Leonard F.	DIK
Siedle, Raymond A.	SLR; DIK
Stodder, John D.	DIK
Safford, Loyal R.	DIK
Stetson, Philip Cushing	SLR; CRI
Stanton, Charles I.	FRF
Stout, Samuel Clarence	SLR; KST
Stephens, Russell S.	FRF
Snyder, Jonathan L.	PFO
Schuler, George F.	DIK
Schustedt, Frederick N.	EDT
Sinclair, William C.	DIK
Sewards, Douglas C.	SMM
Stewart, Robert H.	FLT; DIK
Stuart, Byron D.	VBW
Schumacher, Clyde J.	PWM
Skagerberg, Rutscher	PWM
Spiner, Louis H.	PWM
Smith, George M.	LHV
Shope, Rushmore	SLR; MAT
Steinhauser, Harry H.	SLR; PFO
Suthers, William Glenn	SLR; ELA
Slattery, Patrick Joseph	SLR; LOT
Smith, Harold A.	FRF
Setzler, Harry George	SLR; PMT
Sheehy, John Frederick	SLR; RST
Sullivan, James L.	WFO
Strong, Foster G.	WFO
Scheetz, Jack F.	WFO
Shaffer, Harvey W.	WFO
Snyder, Floyd	WFO
Stoops, Robert C.	WFO
Scherzer, Ralph Julian	RSD; SLR
Sloniger, Eyir L.	FRF
Shannon, Arthur J.	FRF
Smiley, James H.	WFO
Schlipf, Albert C.	WFO
Stone, Alonzo E.	FOB
Spalsburg, Donald C.	FOB
Schmocker, Fred C.	WFO
Sampter, Herbert C.	WFO
Shepherd, Floyd W.	WFO
Smith, Walter S.	WFO
Stoll, Henry H.	KST
Stark, Lloyd R.	KST
Steuffer, Samuel M.	KST
Stafford, Louis Harold	SLR; KST
Simmons, William W.	CAF
Southwick, Philip O.	VBW
Safford, Loyal Robinson	SLR; HHN
Speed, William G.	WDM
Slocum, Paul F.	FRF
Sloan, Harry	DIK
Stalker, Willard Clem	SLR; PMT
Stollenwerck, Edward C.	SMM
Smith, William D.	CAF
Scanlan, Lawrence F.	TFT
Shepherd, Herbert R.	SLR; AAD
Spainhour, Carl M.	DIK
Selff, Robert E.	WFO
Smith, Thomas J.	WFO
Seaver, Lloyd B.	DIK
Spier, James E.	SLR; AAD
Stewart, Kenneth M.	WFO
Shaffer, James H.	CRI
Starkweather, Ralph	DIK
Schaefer, Edgar F.	WFO
Silberman, Mac W.	WFO
Steele, Cyril H.	WFO
Stout, Miner W.	DIK
Steedman, Charles Richard	SLR; KST
Swanson, Leonard Frederick	SLR; KST
Shay, Carleton Carlisle	SLR; RSD
Stegall, J. Rex	SLR; LDT
Scott, Neal J.	SLR; RSD
Solomon, Winfield S.	Note 15

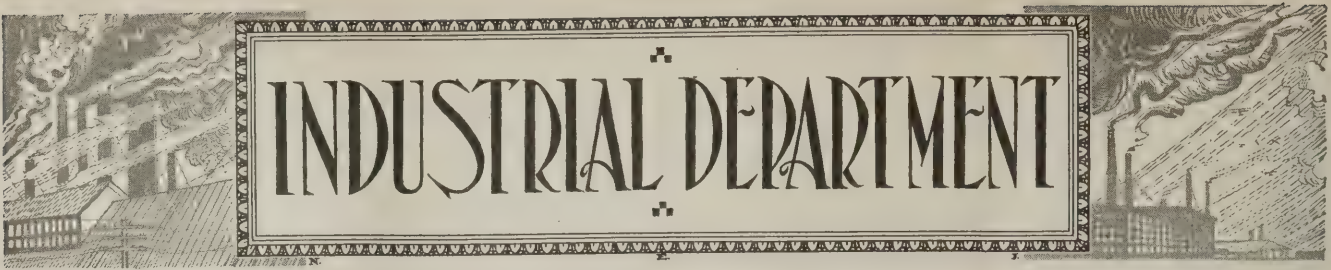
T

Talbot, Clarence P.	FRF; SLR

(*Continued on page 840*)



Front view of the A. G. O. Biplane, with its curious tapering wings, and the single inner interplane strut to the spar, with two struts to the outer bay. (Courtesy of "Flight")



INDUSTRIAL DEPARTMENT

INDIANAPOLIS IN THE AIR WAR

By ERNEST N. SMITH, General Secretary, Indianapolis Chamber of Commerce

AFTER the great drive through the air has become a matter of history and will have ended, once and for all, the menace of Prussian militarism, Indianapolis will recall with satisfaction that it was vitally and materially interested in the preparations which made possible the overwhelming bolt through the blue ether. From the Hoosier capital will have gone forth Liberty motors, propellers, crank shafts, spark plugs and many other intricate parts of the machines which will have made a "peace with victory" a glorious reality.

From an industrial and geographical standpoint, Indianapolis is ideally situated for the rapid construction of aeroplanes and aeroplane parts. The truth of this assertion has been effectively demonstrated by two facts. First, the United States Government has constructed here an aviation repair station and warehouse, where every aeroplane damaged north of the Ohio River and east of the Mississippi, is being despatched for repairs and overhauling. Secondly, many manufactories in the city have been awarded contracts by the Government for the construction of aeroplane parts running into millions of dollars.

It is no secret that one Indianapolis concern has a Government contract to turn out thousands of Liberty aeroplane motors; that another factory is forging crank shafts day and night, and that another is providing the air service with propellers in huge quantities. Sub-contracts for various parts of the aeroplane fuselage are also keeping other factories humming overtime. The war contract bureau of the Indianapolis Chamber of Commerce, through its special representatives in Washington and elsewhere, is constantly placing local industries in touch with aeroplane contract work.

Future Aeroplane Center

Men conversant with aeroplane building in the United States are certain that Indianapolis is destined to become one of the centers of this industry in the near future. It is pointed out that the raw materials necessary for the quick construction of air machines are nearer to Indianapolis than to any large industrial center in the United States. There is a readily available supply of timber and other raw materials, which can be bought cheaper in Indianapolis than elsewhere, because of her central location and excellent transportation facilities. There is no part in an aeroplane which could not be quickly manufactured in this city.

Skilled Labor

Manufactures in Indianapolis are so diversified as to provide an attractive skilled labor market. The permanency and the character of the working class is indicated by the fact that more working men own their own homes in Indianapolis than in any other American city of its class. No one industry dominates Indianapolis, and the slowing down of business in one or two lines does not affect Industrial Indianapolis. Industrial peace is less disturbed here than in any other large factory center in the United States. The open shop policy prevails, guaranteeing fewer chances for dispute between the employer and employe, and in no other city has labor seemed so satisfied as a whole.

Indianapolis is the third city in the United States in the manufacture of automobiles. Just one city—Detroit—places more complete horseless vehicles on the market. Approximately 7,000 men are employed in the following seven large auto factories: Nordyke & Marmon, National Motor Car & Vehicle Corporation, Premier Motor Corporation, Stutz Motor Car Company, Cole Motor Car Company, Empire Automobile Company and Ford Motor Company. Some of these concerns are already turning out aeroplane parts. The rest could easily adapt themselves to the manufacture of heavier-than-air machines.

Veneer Center

Because of its big furniture factories—it being one of the leading veneer and hardwood furniture manufacturing centers in the world, second in rank only to Grand Rapids—Indianapolis could readily turn out all the necessary parts for aeroplane fuselage. One or two are already manufacturing propellers. No less than twelve mills in the city are engaged in the manufacture of veneer. Giant oaks from the north, massive mahogany trees from the Amazon and gnarled ebony woods from Nigeria and Madagascar alike are pushed past the whirring saws and slicers to be cut into pieces as thin as one thirty-second of an inch, and glued on the surfaces of furniture, giving them a polish not obtainable even if solid wood were used.

Aeroplane Repair Station

Although the Government aviation repair station and warehouse will be shortly equipped with enough machinery and aeroplane parts to handle a huge amount of assembling and repair work right on the grounds, the plant is also prepared to call on the factories of Indianapolis during rush periods. The city has an exceptionally large number of iron casting foundries and one electric steel casting foundry, together with a variety of factories that are fitted to undertake the manufacture of the delicate parts of the aeroplane motor and fuselage.

The main facts about the aviation repair station and warehouse are as follows:

Site covers 20 acres.

Two main repair buildings capable of repairing all the aeroplanes damaged north of the Ohio and east of the Mississippi.

Four barracks housing 700 enlisted men, bachelor quarters and houses for married officers, dining hall, commissary, steam heating plant, Y. M. C. A. hut and other buildings.

One hundred civilians, all of them skilled mechanics.

The value of the construction work so far on the plant is in excess of $700,000.

The aviation repair station and warehouse is situated southwest of the Indianapolis Speedway, which in itself offers exceptional facilities for the trying out and tuning up of aeroplanes. The Speedway, one of the best and smoothest brick motor racing courses in the world, is used as a stopping station by flyers en route from Dayton, Ohio, to Rantoul, Illinois.

Shipping Facilities

Indianapolis has seventeen lines of steam railroad and thirteen interurban lines running in every direction. Competitive transportation lines mean better service. A belt railroad circles the city, avoiding congestion, as through freight does not enter the city. Practically every important trunk line of railroad crossing the continent passes through or near Indianapolis, and, in addition, this city is the largest interurban center in the world. The Indianapolis manufacturer has the quickest and most direct access to his national market—wherever it may be.

Markets

Indianapolis is within fifty miles of the center of population of the United States, and 76 per cent of the entire population is within twenty-four hours' ride from the city. Indianapolis is the geographical center of the territory stretching from Maine to Colorado, embracing 92½ per cent of the nation's total population. Indiana itself is a market of no mean proportions and is the very center of the great group of States which form the consuming section of the United States. The reach of Indianapolis is not cut off in any direction by lake or sea, and the manufacturer may ship his goods to all points of the compass with a minimum haul. And parallel rail and interurban lines prevent delays in case one road or line is temporarily out of the running.

(*Continued on page* 838)

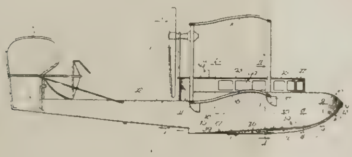
RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,263,846. FLYING-BOAT. Thomas P. Brooke, Chicago, Ill., assignor to The Brooke Aircraft Company, a Corporation of Delaware. Filed May 17, 1916. Serial No. 97,991. (Cl. 244—2.)

1. A machine of the character described, embodying a body having a cabin therein, a roof therefor, the forward portion of the cabin and roof being shaped into freely separable sections, the rear portion of the roof of the passenger cabin being also sectional and adapted to be freely opened.

3. A machine of the character described, embodying a body comprising a housing, the bottom thereof being shaped to form steps spaced longitudinally of the body and also spaced from the forward end thereof, and provision for forcing air currents through the upright portions of the steps, the portion of the bottom between the steps and also at the extreme top of the prow for a short distance being flat, and the portion of the bottom between the said portions forming a straight line from the keel laterally to the edges of the body and diverging laterally from a medial line, at inclined angles and gradually merging into said flat portion, at the prow.



6. A machine of the character described embodying a body comprising a housing, the bottom thereof being shaped to form spaced flat portions extending longitudinally of the bottom, one of said portions being located at the front of the body and extending but a short distance and the other flat portion being located midway of the body, the portion of the bottom between said flat portions forming a straight line from the keel laterally to the edges of the body and diverging laterally at inclined angles from a medial line, one extremity of said inclined portion gradually merging into the adjacent flat portion at the front of the bottom, the other extremity of the inclined portion forming an abrupt V shape, the portion of the body in rear of the flat portion which is located midway of the body, forming a flat step and inclining upwardly in rear of the step and toward the stern, the forward end of said bottom being also shaped into an upwardly extending angle.

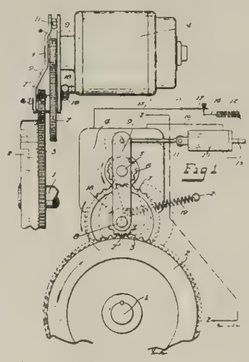
8. A machine of the character described, embodying a body, a propeller, a motor for actuating the propeller, said motor housed within the said body, and provisions whereby the operation of the propeller will induce a circulation of outside air across the motor cylinder for cooling the motor, the said provisions embodying a casing arranged around and spaced from the motor cylinder, said casing having open ends, and flanges arranged between the cylinder and casing and extending lengthwise thereof.

10. A machine of the character described, embodying a body having a compartment therein, a motor arranged in the compartment and entirely housed thereby, a propeller, and provisions whereby the operation of the propeller will cause outside air to circulate into the compartment, across the motor cylinder and out of the compartment, said motor being arranged on a vertical axis and embodying a plurality of superposed cylinders.

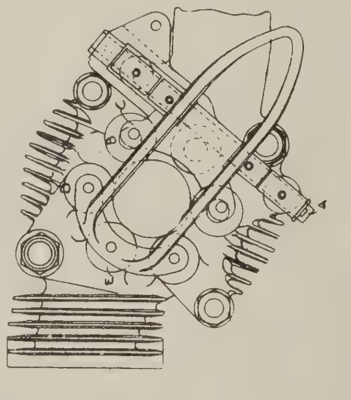
1,262,666. STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES. John O. Heinze, Springfield, Ohio, assignor to The John O. Heinze Company, Springfield, Ohio, a Corporation of Ohio. Filed March 1, 1916. Serial No. 81,397. (Cl. 74—7.)

1. In an apparatus of the character described, the combination, with the crank shaft of an internal combustion engine, of a gear operatively connected therewith, an electric motor, a gear arranged to be driven thereby, a pinion arranged to tilt about the axis of said motor gear and in operative relation therewith, together with means for throwing said pinion in mesh with said engine gear, a stop for said pinion, the direction of rotation of said pinion being such as to tend to hold it in mesh with said engine gear and against said stop.

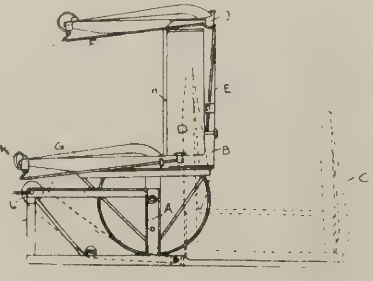
3. In an apparatus of the character described, the combination with a crank shaft of an internal combustion engine, of a gear operatively connected therewith, an electric motor and its shaft, and a pinion tiltable about the axis of said shaft and operatively connected therewith together with means for tilting the same in mesh with said gear, the parts being so disposed with respect to each other that when said pinion is in mesh with said gear, the axes of said pinion and the said shafts will be in substantial alignment with each other so that when said pinion is the driving element the tendency is to maintain it in mesh with said gear by the driving action thereof and when said gear is the driving element the tendency is to throw said pinion out of mesh therewith by the driving action of said gear.



110,967. The design and construction of valve gear for internal combustion engines of the Vee type fitted to aircraft shown in the accompanying figure has been patented by Messrs. A. E. Berriman and the Daimler Co., Patent No. 110,967, and the inlet and exhaust are actuated from a common cam shaft located low down in the Vee, by overhead levers mounted on a spindle inclined to the axis of the cam shaft. This inclined spindle is shown at "A," and the inlet valves "B" are actuated by the lever "C," the exhaust vales "D" being operated by the lever "E." The ends of the levers are engaged by driving rods and are in a plane containing the axis of the cam shaft.

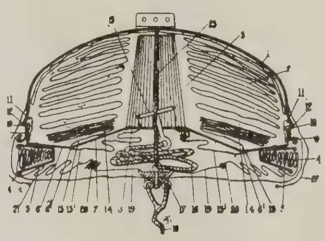


111,178. An apparatus for use in assembling aeroplane wings, comprising a stand and a framework, on which the wings are secured in correct relative position, and the framework pivoted on the stand so that the wings may be held in a substantially vertical position at the ground level to be stayed, wired, fitted, etc., and can then be carried to a substantially horizontal position at the correct height for securing to the aeroplane body, is illustrated, and Patent No. 111,178 has been granted to Mr. H. T. Williams for same. The stand is shown at "A," and the framework "B" is pivoted to same, with the wings "C" and "D" secured to the framework. Separate apparatus are provided for right- and left-hand wings, the frameworks "B" being interchangeable on the stands "A," and the apparatus may be arranged to deal with the wings of mono-, bi-, tri-, or multi-planes. The framework "B" comprises a pair of front bars "E," each provided with top and bottom bars "F" and "G," stayed by pillars "H," and connected by ply boards. Seatings "J" are provided on the front bars "F" for the edge of the wing "C," and the pillars "H" form an abutment for the wing "D." The upper surfaces of the top and bottom bars "F" and "G" are positioned so as to carry the wings the correct distance apart and at the correct inclinations, longitudinally and transversely. Hand-operated clamping levers "K" are provided at the rear of each top and bottom bar. The bottom bars "G" are carried by a platform pivoted on the stand "A" and operated by an endless cable passing round a hand-operated winding-drum "L" on the stand "A" and attached to a segmental drum on the platform.



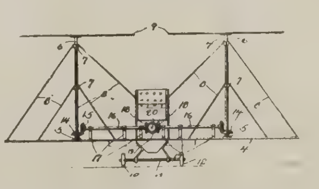
1,263,372. PARACHUTE. Everard Richard Calthrop, London, England. Filed Mar. 27, 1917. Serial No. 157,854. (Cl. 244—21.)

4. In a parachute launching device the combination of a container for receiving the main parachute in a compactly folded and plaited condition a support detachably connected to said container a trough and shaped member on said support adapted to receive the auxiliary parachute also in a compactly folded and plaited condition a cage on said support about which the folded and plaited main parachute is arranged when packed a center piece connections or tapes between said center piece and the main parachute and the plate pertaining to the aforesaid support a member for the connections or tapes pertaining to the auxiliary parachute and a connection between said member and the center piece.



1,264,152. AEROPLANE. Ernest G. Briggs, Brookville, Pa. Filed Aug. 1, 1916. Serial No. 112,586. (Cl. 244—14.)

In an aeroplane, a body, a main plane projecting from each side of and beneath the body, supporting bases secured on the upper surface of said plane at each side of, and equi-distant from, the body, vertical shafts rotatably supported by said bases, flat circular planes secured on the upper ends of said shafts, a motor carried by the body, and driving connections between said motor and shafts for causing simultaneous rotation of the shafts in opposite direction whereby the planes mounted at the upper ends of said shafts will be rotated oppositely simultaneously and in a plane above the said main plane so as to resist forces tending to cause rocking of the aeroplane about the longtitudinal axis of said body



FOREIGN NEWS

BELGIUM

According to advices received in Washington Sub-Lieutenant Willy Coppens, a Belgian aviator, earned his ninth and tenth victory in less than six weeks in the course of a few moments.

Coppens set fire to a German "Drachen" balloon flying above the woods at Ploegsteert and then downed an enemy biplane which attacked as he was returning to the Belgian lines.

FRANCE

A report from French Headquarters on June 25th reads:

"On June 23 five enemy aeroplanes were brought down or forced to land in a damaged condition. Fifteen tons of projectiles were dropped on aviation grounds in Picardy along the Aisne and on bivouacs in the neighborhood of Chaulnes and Montdidier.

"On June 24 six enemy machines were brought down or fell in a damaged condition. More than four tons of projectiles were dropped on aviation grounds in the Aisne region."

The text of the War Office statement of June 26th reads:

"On June 25, twenty-two enemy machines were brought down or forced to land in a damaged condition. Three Drachen balloons were burned. Our bombing planes in the night and day dropped more than seventeen tons of projectiles on aviation grounds, bivouacs, cantonments, and munitions depots in the battle zone. Explosions and fires were observed."

An official statement issued early on June 27th says:

"Last night several groups of enemy aeroplanes were perceived coming in the direction of Paris. An alarm was given at 11:16 o'clock. The aerial defences went into action and the anti-aircraft batteries threw up a violent curtain of fire.

"Several bombs were dropped causing material damage.

"'All Clear' was given at 12:35 a.m. Thursday."

On the night of June 27-28 several squadrons of enemy aeroplanes penetrated the defences of the Paris district last night. Anti-aircraft batteries violently shelled them.

Several bombs were dropped and material damage was done. There were few victims.

The alarm was sounded at 10:39 p.m. and the "all clear" signal at 12:05 a.m.

GREAT BRITAIN

The British official report on aerial operations issued June 24th says:

"In the strong winds and low clouds of June 23 our aeroplanes carried on reconnoissance work and artillery co-operation with difficulty. There was little aerial fighting. One hostile machine was destroyed during the day; two of our machines failed to return.

"Five tons of bombs were dropped by us during the day and fifteen tons on the following night, over six tons falling on sidings and stations at Cambrai with good effect. One of our night-flying machines is missing.

"Sunday evening our bombing squadrons carried out a series of attacks on the Metz-Sablons station. Three raids were made during the early evening, and a fourth after nightfall. Over six tons of bombs were dropped on this objective.

"Our formations were attacked by enemy aeroplanes, one of which was sent down in flames and another driven down out of control. All of our machines returned."

According to a dispatch from British Headquarters on June 25th, confirmation has been received from German sources regarding the losses of German machines in the air raid over London on May 19 and 20. In addition to seven of the squadron, numbering twenty, which are known to have been brought down, it now appears that three more machines crashed on landing.

The British statement for June 26th says:

"On the morning of June 25 attacks were carried out by our bombing squadrons on the railway sidings and factories at Saarbruecken, the engine sheds and barracks at Offenburg and the explosive factory and railway station at Karlsruhe. Many direct hits were observed on the engine sheds at Offenburg, and also on the barracks there.

"At Karlsruhe two direct hits were observed on the engine sheds and on the Metallurgique Works, where a large explosion was caused.

"Photographs confirm the extent of the damage in the two places. The factories and station at Saarbruecken also were damaged.

"A number of reconnoissances also were carried out and photographs taken.

"In air fighting ten enemy aeroplanes were destroyed and four driven down out of control. Seven of our machines are missing.

"The total of bombs dropped during the day and night amounted to ten tons."

An official communication on aerial operations issued June 27th says:

"Seven German machines were brought down by our airmen on June 26, and two others were driven down out of control. Two of our aeroplanes are missing.

"Our bombing machines dropped fourteen and one-half tons of explosives on enemy railway stations, dumps, transports and billets and on the Bruges docks.

"On the night of June 26-27 bombing operations continued, and sixteen tons of bombs were dropped by our night flying machines on various targets. Our aeroplanes attacked the chemical works at Ludwigshafen, the factories and railway sidings at Saarbruecken and the aerodrome at Bolchen. Several bombs fell on an active furnace at Saarbruecken. At the Bolchen aerodrome two hangars were set on fire, and also one machine, which was out on the aerodrome.

"All our machines returned safely. One of our machines, which yesterday was reported missing, has since returned.

"The enemy bombed one of our aerodromes during the night. No damage was done to our aeroplanes."

"In our home waters, notwithstanding the handicap of fog, numerous anti-submarine flights were made, hostile aircraft were attacked and the escorting of shipping was carried out by our seaplanes, airships and aeroplanes. Submarines were sighted and bombed and enemy mines were located on a number of occasions.

"In Mediterranean waters enemy submarines also have been sighted and attacked and enemy mines were located, and Allied and neutral shipping was convoyed. During the same period aircraft attached to the British Ægean squadron bombed aerodromes of the enemy at Drama, and other places in the Dardanelles were attacked. Two of the enemy's fighting scouts were downed in flames."

GERMANY

The German communique of June 26th said:

"Five aeroplanes were shot down out of an enemy squadron which on Monday flew from south of Soissons to the Aisne to drop bombs. Altogether twelve enemy machines and three captive balloons were brought down."

The official communication for June 27th from general headquarters says:

"Five aeroplanes were shot down out of an enemy bombing echelon, which during the last two days has raided Karlsruhe and Offenburg, an industrial region of Lorraine. Yesterday our bombing squadrons attacked Paris and the enemy's railway junctions and aerodromes on the way there."

HOLLAND

A mob of Dutch fishermen attacked a hotel on June 14 in which German airmen were interned, as the result of a submarine shelling the lifeboats of a Dutch lugger sunk without warning. The Germans were saved by the police.

A dispatch from Amsterdam dated June 20 says:

"First Lieutenant Loerzer, one of Germany's most famous air squadron leaders, has been wounded, the "Cologne Gazette" reports.

"Lieutenant Loerzer is credited with having won thirty-three air encounters, for which he received the Order Pour le Merite.

ITALY

Italian seaplanes have visited the scene of the action Monday where two Austrian battleships were torpedoed by two Italian torpedo boats and have found wreckage a mile square ten miles north of where the attack too place, having been carried there by the currents. Many dead sailors also were seen in the water and Austrian destroyers were discovered towing another destroyer along the coast.

The seaplanes also visited the harbor of Pola and ascertained that there is only one Austrian dreadnought there. As there is no other dreadnought afloat anywhere in the Adriatic, Commanded Rizzo and his companions feel satisfied that they sank both the Austrian warships.

Italy issued the following on June 16th:

"Three Austrian aeroplanes were brought down over the Piave to-day by one Italian flier."

An Italian statement of June 17th says:

"The aviation service has continued to take a very important part in the fighting, notwithstanding the unfavorable flying conditions. Forty-four enemy machines have been brought down during the last two days."

The Italian statement issued June 19 said:

"The number of enemy aeroplanes brought down now amounts to fifty. Two of our own or Allied machines are missing."

The Italian official for June 20 is as follows:

"From dawn to sunset our own and allied airmen and the seaplanes of the Italian Royal Navy were all active in chasing and not allowing the enemy to approach our lines for observation or for other aims. Our machines carried out bombardments, attacked the enemy with machine gun fire, and participated uninterruptedly and effectively in the battle.

"Fourteen enemy machines were brought down. One of our airmen did not return. Along the whole front our observation balloons cooperated usefully and courageously."

The text of the Italian War Office statement of June 25th reads:

"During the day yesterday and last night our aeroplanes carried out effective bombardments. On June 23 and 24 nine enemy machines were brought down."

The statement issued by the Italian War Office on June 26th said:

"Our flights dropped several tons of bombs on enemy ammunition dumps on the Venetian Plain and on railway establishments at Mattarello.

"Seven hostile machines were brought down. Lieutenant Flavio Baracchini obtained his thirty-first victory."

Chaplain Tells King of Studied Atrocities of Teuton Flyers

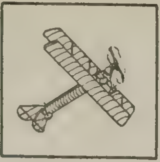
King George, learning that the chaplain of a British hospital in France which was marked by the Germans for attack was in London, sent a messenger to the chaplain asking him to call at the palece.

The chaplain said that two enemy machines first came over the hospital and dropped three bombs, two of which were explosive and fell in the outer wards, while the third was a large incendiary bomb, which dropped in the middle of the building, starting a fire.

No sooner had the fire broken out than one of the German machines returned and, flying low, commenced to fire with machine guns upon nurses and men who were rescuing the wounded.

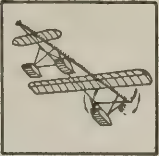
The chaplain was emphatic in his statement that the Germans could not possibly have mistaken the building, and at the King's request he illustrated his words by diagrams of the locality.

King George expressed his abhorrence of the outrage and asked the chaplain to convey his sympathy to those injured in the attack.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE general appearance of flying models changes each year, as the accompanying records will show, and of course the records increase in proportion to the efficiency of the design.

The model shown at the top is the first record holder in the United States and was built by Percy Pierce, now a lieutenant in the Aviation Section. The record of this model was something like 200 feet or so. This is wonderful when you think of the primitive methods used in those days when aeroplane flight was still a mystery. The record today is close on to a mile with a duration of 207 seconds.

The Pierce model was about 24 inches long of the single propeller pusher type, and the main plane had a spread of 24 inches. The covering was lining sewed on to the rattan wing forms. The propeller was of the high speed type and 8 inches diameter.

The Page model of 1910 was a new idea in model design, while the twin propeller idea was copied from British machines of that time; the wings were mere slats 2 inches chord and 24 inches in width. The model was very light and traveled at tremendous speed attaining great heights when in flight. The propellers were small in diameter and revolved at tremendous speed. The model was 48 inches long and the propellers were driven by three strands of one-eighth inch square rubber.

In 1911 Cecil Peoli made a wonderful record with a new type of model having a sort of "A" frame. He believed that a wing pointed at the ends served to stabilize the machine when in flight, and built his model accordingly. This model made a record of 1,691 feet at Van Cortlandt Park, New York City.

The next model was a surprise to model builders in 1912. When the author appeared with this machine he was laughed at. The other flyers said that a machine with such wing surface 24 by 5 inches and propellers 10 inches in diameter would not do much as a record-breaker, but one fine day it did go 2,003 feet and the propellers revolved so slowly that you could almost count the revolutions in the air.

This was the forerunner of the large surface slow speed type and the model of today resembles it a great deal, only a few changes as to light weight and refinement of details.

The frame of this model was made of two sticks of Balsa wood 36 inches long and tapering from three-quarter inch at the middle to one-half inch at the ends. Balsa wood is as light as cork but has very little strength. The propellers were driven by four strands of one-eighth inch square rubber.

The Selley model was another surprise. The propellers were of extremely high pitch, being cut from a blank 2 inches deep and 1 inch wide. In the air they revolved very slowly about 600 revolutions per minute and the model never flew more than 40 feet from the ground. Selley's record was 2,800 feet. When fitted with pontoons it made a record of 53 seconds duration rising from the water. This was more than double the English record of that time.

The model made by Wallace Lander resembled the other types a good deal, but the construction was very light. The wings were double surfaced and covered with gold-beaters skin. The construction of the wings was of the thinnest bamboo strips and weighed three-quarter ounce. The frame was 42 inches long. The sticks were one-quarter inch thick at their widest portion and tapered to three-sixteenth inch.

From this we see that the successful model is the one that is light and carefully designed. The Ward Pease model which is the record holder today weighs less than two ounces.

(*To be continued*)

Illinois Model Aero Club R. O. G. Duration Contest

On June 16 the Illinois Model Aero Club held an R. O. G. Duration contest at which some very fine flying was done. The best average as well as the best flights were made by Wm. Schweitzer. The three official flights of the leading competitors were as follows:

Wm. Schweitzer.......	137 secs.	126 secs.	15 secs.
J. Krawiec.............	98 secs.	96 secs.	15 secs.

After the official flights were completed the boys removed their chassis and attempted to improve their hand launched records. Some very fine flights were made in this way. Davies made flights of 105, 40 and 170 seconds. Krawiec made 101 and 108 seconds.

The climax of a day of good flying came when Wm. Schweitzer had an official flight of 230.8 seconds, thus breaking the world's record of 207 seconds held by Ward Pease, also of this club. The model was of the same general type of twin pusher as is generally used by the Illinois boys but with a refinement of details of design and construction, to which, no doubt, its superior flights can be attributed.

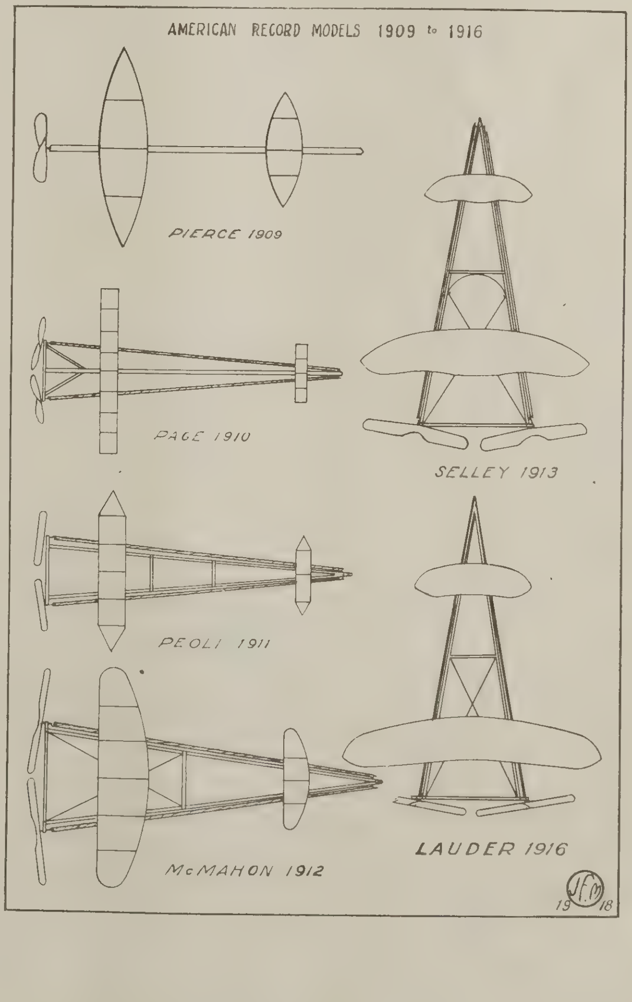
The model was 36 inches long, weighed 1.96 ounces and was driven by four strands of 3/16″ flat rubber turning thirteen inch propellers.

The members of the club intend to make particular efforts to break the R.O.G. Duration record in the near future, as this in the only record not held by this club.

Illinois Model Aero Club to Hold Contests

The Illinois Model Aero Club has arranged a series of contests for the year in competition for the Laird-Weaver Trophy. This cup is awarded annually to the flyer having the best average for the year. Last year it was won by William Sprague with William Schweitzer a very close second. The schedule for the year is as follows:

June	2	R. O. G. Distance
"	16	R. O. G. Duration
"	30	R. O. G. Duration
July	14	Hydro Duration
"	28	Hydro Duration
Aug.	11	Hand Launched Duration
"	18	Hydro Duration
Sept.	1	R. O. G. Tractor Duration and Distance
"	15	R. O. G. Duration
"	29	R. O. G. Distance
Oct.	13	Hand Launched Distance
"	27	Hand Launched Distance



Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Right!

"Explain the meaning of celerity," commanded the teacher. "It's what you get out from under a falling aeroplane with," answered the young hopeful who had been reading aeronautical literature.

Times Do Change

Spring is here in all its glory,
Filled with sweetness is the air,
Painted green are all the meadows
And the birds sing everywhere.

So begins a poem written
In the Ozarks far away,
As I watched a Maltese kitten
Roll upon the lawn at play.

"Times do change," so goes a saying,
And believe me, it is true,
For the spring in all its glory
Now presents a different hue.

I am stationed on the beaches
Keeping seaplanes in the sky;
With my pockets full of wrenches,
Glad that our machines will fly.

Here one comes down in a spiral,
Skims the water through the spray,
Heads toward the signal given
On the beach of Great South Bay.

Men in boots wade out to meet her
And we fast her with a line;
"How's she running, Mr. Pilot?"
And he yells back, "going fine."

And we make a quick inspection,
Add some gasoline and oil,
Fill the water radiators,
Shove the pontoons from the soil.

And the motor starts to humming,
And we turn her nose to sea;
"All is clear," we tell the pilot,
And he signals "set her free."

And the whirl of the propeller
Blows the sand into our eyes,
As she skims across the water
Once again toward the skies.

Spring is here in all its glory,
Filled with seaplanes is the air,
And we stand with upturned faces
Hearing motors everywhere.

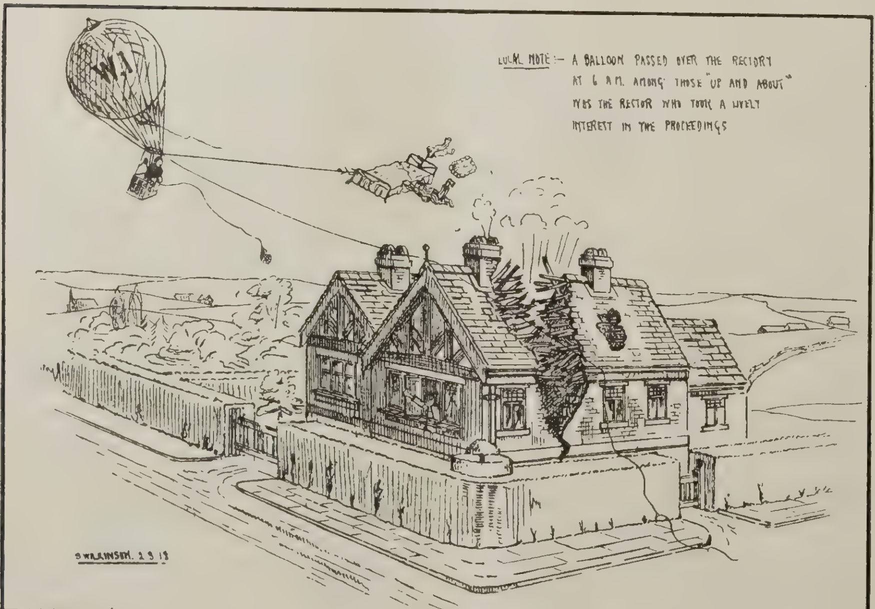
FARRAR BURN,
U. S. Naval Air Station, Bay Shore.

Limericks

Large and marvellous is the Caproni,
Even young ones appear over-growni.
If they get any bigger,
What price the poor rigger!
Unless they are braced by Marconi.

A pilot who'd learnt on a Blériot.
Always thought he was rather a heriot,
Till someone cried "Steaduet,
I learnt on a Breguet."
Then his pride sank to somewhere near Zeriot.

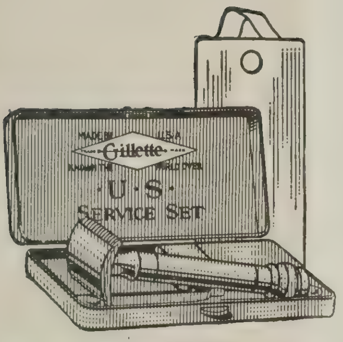
Whilst rigging a 'bus, an A.M.
Said, "Golly, this 'bus is a gem,
Gott strafe its designer,
I cannot align 'er,
I must wangle the angle *pro tem.*"



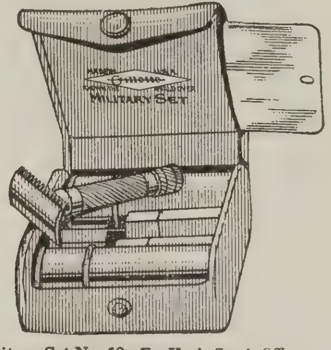
LOCAL NOTE:— A BALLOON PASSED OVER THE RECTORY AT 6 A.M. AMONG THOSE "UP AND ABOUT" WAS THE RECTOR WHO TOOK A LIVELY INTEREST IN THE PROCEEDINGS

German bombs have again been dropped on London schools. After a while that will be the only way to get anything German into the American schools.
—Newark News.

Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅝ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

Why the Soldier Chooses the Gillette

There are mighty few personal belongings a man in the Service can pack around—and the greatest of his comforts is his Gillette.

Wind-chap, sun-burn, cold water, cold weather only give the Gillette a bigger opportunity to show *service.*

There isn't a mile of the battle-fronts, nor a ship of the Allied Nations, but has its Gillette users by the tens and the hundreds. The compact, portable razor that can always be depended on for service.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit in the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

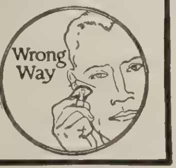
Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down tight. If you want a specially close shave, unscrew the handle a part turn.

Hold the razor naturally and easily, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.



Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass. U. S. A.

A THOUSAND

willing workers made it possible for this powerful aeroplane to take to the skies to help win the war in the Air for the Allies.

The American Air Program is a stupendous task and its success depends on the efficient co-operation of every organization that can devote machines and man-hours to the task.

Ask our Contract Work Department how you can help.

Aerial Age Weekly

280 MADISON AVENUE
NEW YORK CITY

(*Continued from page* 832)

Power

Indianapolis has an inexhaustible supply of steam coal at her very door—Indiana mines being within sixty miles, delivering coal by three lines of railroad. Indiana stands fifth in the total quantity of coal mined in a list of twenty-eight coal-producing States. Indiana steam coal ranks with the best of the middle-western coal in British thermal heat units. The average is 11,697 heat units, and some of the Indiana coal yields as much as 12,325 heat units. The State geologist says there are 50,000,000,000 tons of this coal and that it will last 180 years at the present rate of consumption. Two competing companies furnish electric current at rates that compare favorably with cities enjoying water power in the manufacture of electricity. Artificial gas is sold for domestic purposes at 55 cents a thousand cubic feet and at a much lower rate to large users—one of the lowest rates in the United States.

Raw Materials

Indianapolis is a natural base for most sources of raw materials. No city has near its gates every form of raw material. Each city has some and Indianapolis has its share. The observant manufacturer will see at once that the very conditions which make Indianapolis dominant as the center of the country's market, together with the city's shipping facilities, solve the problem of raw material. Since Indianapolis is nearer than any other city to every possible customer in the United States, it is likewise nearest to all existing raw materials. And being nearer, and having competitive shipping facilities in all directions, Indianapolis is the natural base from which to draw quickly and economically on the sources of raw material.

Living Conditions

Indianapolis is best known as a city of homes. There is practically no slum district and few tenement houses. The workers for the most part live in cottages under wholesome and sanitary conditions. There are 1,752 acres of parks scattered through all parts of the city and fourteen special recreation playgrounds maintained by the city during the summer months, in addition to 59 tennis courts, 22 baseball fields and 3 municipal golf links. There are 292 churches, 76 public school buildings, 3 high school buildings, 21 parochial schools, 24 colleges (including classical, medical, law and dental) and 19 branch libraries, besides the new central public library. The various social agencies in Indianapolis exert an unusually helpful influence in the community and help to make the city one of the most attractive places in the whole country in which to live and rear a family.

Atlanta Offers Aviation Inducements

By D. C. Lawhon, Assistant Secretary, Atlanta Chamber of Commerce

ATLANTA is the central location for any industrial development in the Southeastern territory, and its excellent climate makes it especially suitable for the location of aircraft factories.

The city is located upon a ridge, the backbone of the Blue Ridge Mountains, and is 1,050 feet above the sea level. It has a bracing climate, without great extremes of heat or cold.

The southern headquarters of many northern and eastern manufacturing concerns are located in Atlanta; there being about four hundred manufacturers' agents in the city.

It is the center of vast activity on the part of the Government, which has twelve cantonments in this section, with about 400,000 troops

Camp Gordon is one of the greatest cantonments built by the Government, at a cost of about six million dollars and occupied by a division. It is believed that these quarters will be largely increased, and the Government is now taking steps to secure additional land. Atlanta will probably become the center for some 50,000 or 60,000 troops in the near future.

As the Government is acting upon the necessity of the case and not upon favoritism for any city, it will be seen that the location at this point of important enterprises by the Government is based upon merit and the advantages of Atlanta as a center.

There are a number of available properties about Atlanta that could be utilized for factory sites and landing fields; some grading, of course, being necessary to put the fields in proper condition. The clay soil of Georgia packs firm and smooth. The Southeastern Fair, a permanent institution located in this city, possesses one of the best mile race courses in the South, this tract being of clay.

The population of the city to-day is 240,00 and there are 243 miles of street railway, with an excellent system of transfers, enabling the movement of labor to and from all outlying sections.

One secret of Atlanta's remarkable growth is to be found in

Jove's Thunderbolt!

To build a weapon of the skies, invincible as Jove's Great Thunderbolt of old—that is the work to which our all is dedicated.

STANDARD AIRCRAFT CORPORATION

A REAL FIGHTING INDUSTRY
Elizabeth, New Jersey

Member of Manufacturers' Aircraft Association, Inc.

the fact that the people pull together on all questions that affect the prosperity of the city. They have a splendid civic pride, which is known as the "Atlanta Spirit." In great crises an appeal to the "Atlanta Spirit" is never heard in vain. The business and professional men of Atlanta give more of their time and money to public work than those of almost any other community in the South. They are organized through the Atlanta Chamber of Commerce for all kinds of constructive work designed for the upbuilding of the city or improvement of the conditions of life and business.

Atlanta is the center of great war activity on the part of the United States Government. In addition to Camp Gordon mentioned before there has been located in Atlanta the following Government institutions:

The Supply Depot for the Southeast.

The Medical Supply Depot for the Southeast.

A general hospital for the Southeast.

A Regional Bank for Georgia, Florida, Alabama, Mississippi and Tennessee.

The Regional Director of Railroads for the Southeast, controlling an immense traffic in this region.

Headquarters of the Railway Mail Service for the Southeast.

An aviation school with 600 students.

The Government Repair Shop now being erected at a cost of about two million dollars, to employ about 1,500 men, engaged in repairing motors, machinery and all sorts of articles for the cantonments of the Southeast.

The Government Reclamation Works repairing clothing, shoes, hats, tents and other articles. We are informed that these works will employ about 2,500 persons. The Government is now negotiating for a building in which to establish this factory and will start it at the earliest possible moment. A large volume of work is already consigned to Atlanta and awaiting repairs by these works.

A Remount Comp in connection with Camp Gordon.

An artillery range twenty miles from Camp Gordon and to be connected with that camp by a military road.

A rifle range about fifteen miles from Camp Gordon and to be connected by a military road.

Inquiries regarding Atlanta as a location for aircraft and other factories should be addressed to the Atlanta Chamber of Commerce.

We have received two notices from the Government:

1. Your application for a license to fly is disapproved.

2. Since your Penguin does not leave the ground there is nothing to stop the use of them.

Wherefore,

YOU MAY LEARN TO FLY
BY THE
BEECH FLIGHT SYSTEM

PROCEDURE:

You apply for a license for the purpose of making practice flights on Salt Plains, Okla., to The Joint Army & Navy Board for Aeronautic Cognizance, 1607 H Street, N.W., Washington, D. C.

You then pay us a fee of $125 for which we prepare you to the point where you may safely go up alone in our airplane, which we rent you for 65c each minute of actual flight, including the cost of breakage, with the proviso that you follow our instructions, because while our Penguin is harder to handle on the ground than an airplane is in the air in normal weather, there remains the principles of the landing to teach, which is easy by our system providing instructions are followed.

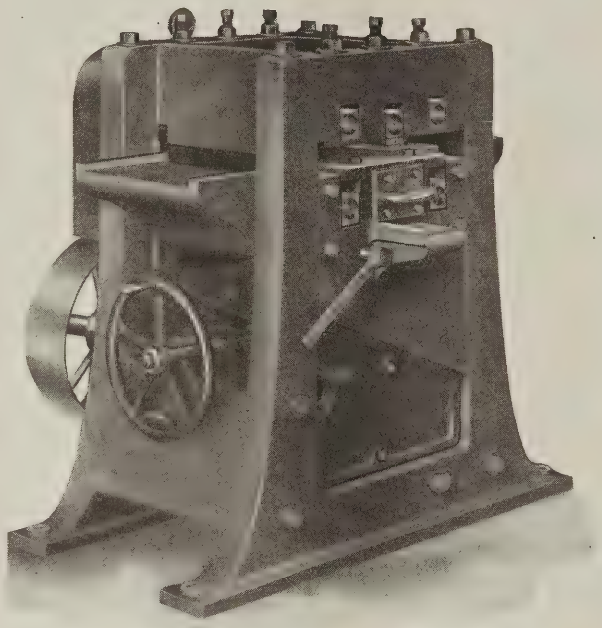
Address

THE BEECH FLIGHT SYSTEM CORPORATION
Cherokee, Okla.
Pioneer aviator A. C. Beech, President.

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY
Toothing Machine


Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog and samples of toothing

Baxter D. Whitney & Son
WINCHENDON **MASSACHUSETTS**

(*Continued from page* 831)

Travis, William Seybold	SLR; DAP
Trueheart, James Overton	SLR; PMT
Thresher, Ebenezer S	PWM
Taylor, Arthur W	SMM
Truitt, Leon' Olover	SLR; CGC
Thomas, William G	LHV
Thompson, Roland S	EOT
Tenhope, Jerry J	SLR; AAD
Thomas, Charles E	PFO
Taylor, Marvin H	FRF
Tyree, John Wade	SLR
Taylor, Alfred B	DIK; FRF
Trantham, Homer	WFO
Tips, Eugene C	WFO
Tupper, Preston E	WFO
Taylor, Howard Story	SLR; PFO
Todd, Edwin T	WFO
Tillisch, William H	FRF
Thompson, Arthur F	WFO
Telfair, John Chandler	SLR; WAC
Turrill, Gardner Stilson	SLR; KST
Toppan, Cushing	KST
Turner, Homer H	KST
Taylor, John A	DIK
Talbot, Elmer R	DIK
Taylor, Alfred Bucklieur	SLR; CAF
Traughber, Jesse Douglas	SLR; CGC

V

Vincent, John H	SMM
Valentine, Allen W	TFT
Vendig, Morales Casseres	SLR; PFO
Vogt, Edward Charles	SLR; KST
Venton, Wilson L	WFO
Vinton, Benjamin	WFO
Vandermeer, Dirk J	FRF

W

Wilson, Frank G	FRF
Walrath, Duane E	FRF
Wilford, Robert Nicholas	SLR; RWT
Wood, Harold Burroughs	SLR; GLC
Westall, William Henry	SLR; PMT
Winters, Bert	CPR; DAP
Woltz, Roscoe	FLR; DAP
Welch, Paul R	FRF
Wymond, William J	PFO
Woolf, Douglas G	LHV
Weitekamp, Elmer J	FRF
Worth, Paul	EOT
Weddington, Harry	PWM
Wells, Harold Ralph	FRF
White, Kenneth Taylor	FLT; DIK
Ways, Karl H	PWM
Walker, Clarence R	FRF
Welles, Charles B	PFO
Wolf, Irwin D	FLR
Wehrell, Albert J	LHV
Wheeler, Sylvester L	CAF
Wentworth, Harold S	WFO
Webster, Lewis Selwyn	SLR; AAD
Wimer, William B	FRF
Welch, Peter Westley	SLR; RSD
Whitehead, Eugene Cunningham	SLR; PFO
Weiser, Victor Albert	SLR; AAD
Werner, Raymond E	SLT; PFO
Wolff, Charles	SLT; PFO
Williams, Stanley T	DMA
Ward, Peter Garner	SLR; PFO
West, Norman Stewart	SLR; KST
Worrell, Willard Parker	SLR; KST
White, Zebulon L	CAF
Wood, Walter C	CAF
Wiley, Esmond Fenton	SLR; RSD
Wilson, Guy H	SLR; DIK
Williamson, Cleburne Milton	SLR; KST
Williams, William Pearce	SLR; RSD
Whitman, John B	WFO
Walthall, Leroy A	DIK
Wiley, Barton L	CRI
Wendell, Lay A	WFO
Williamson, James C	WFO
Winkle, William E	WFO
Whitten, Lacey R	WFO
Wait, Harry W	WFO
Whiting, Bryan F	WFO
Wagner, Albert G	VBW
Webster, William P	WFO
Wagoner, George A	WFO
Waite, Eugene, Jr	SLR; KST
Wright, Oscar Catlette	SLR; GLC
Williams, Paul Beauchamp	SLR; RDT
Wing, Leo	SLR; KST
Wendt, Carl Albert	SLR
Worthen, Charles Bertrand	Note 16
Walton, Lester Roberts	FLR; DAP

Y

York, Duke A	DIK
Yackey, Wilfred A., Jr	LHV
Young, George E	PWM
York, Philip S	WFO
Younger, John E	WFO

Z

Zingermann, Ernest Louis	SLR; RWT

(*Continued from page* 821)

defects only developed after long trial in the air; new types of aeroplanes favorably reported on when first tried are found on longer experience not to give complete satisfaction, and yet is is impossible, if we are to keep ahead in the keen struggle for aerial superiority, to wait for full experience before placing orders. Risks must be run, and new types must be adopted at the earliest moment consistent with reasonable assurance that they will constitute a substantial improvement on what is already in use. Orders must be placed, moreover, for considerable numbers and for delivery over many months, as the large output required for our present flying services can only be obtained by bulk orders permitting a high degree of sub-division of work.

The next step in the problem is the balancing of the engine and the aeroplane programmes. Owing to the much longer period required for the production of engines than of aeroplanes, orders for the former must be placed for relatively long periods ahead, before it is known what types of aeroplanes will be required when the engines become available.

The problem is complicated by the fact that manufacture and delivery rarely if ever proceed in accordance with anticipation. The output of a particular type may be delayed for weeks or even months owing to some technical difficulty of manufacture. Moreover, as replacement of losses and expansion are proceding simultaneously in the flying services, and the rate of wastage in different types of engines and of aeroplanes varies considerably according to circumstances, it is impossible to forecast with accuracy what engines will be available for the equipment of new types of aeroplanes after wastage has been made good. Nor is it possible to any great extent to adjust the programme by modifying orders once placed without disorganizing supply. The

(*Continued on page* 842)

NEW EPOCH IN AVIATION

POPULAR PRICED
TWIN MOTORED HARLEY-STROMER
AEROPLANES
HYDROAEROPLANES — FLYING BOATS

Standardized
As to
EFFICIENCY
SAFETY
DURABILITY
PRICE
MANUFACTURE
MATERIALS
ENGINES
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(*Continued from page* 840)

problem does not end here. Whenever a new type is introduced provision must be made for accumulating a sufficient "head" of spare engines, spare aeroplanes and spare parts of innumerable kinds, to keep the squadron to be equipped with that type in a condition to make good the day-to-day wastage and carry out the constant repairs required.

Such being the nature of the problem, it is satisfactory to be able to record that during the year 1917 not only was the number of squadrons of aircraft on the various fronts increased in a notable degree, but there was a complete replacement of machines and engines of the older types. The very great increase in output which is being obtained has placed a considerable strain on the workers in the aircraft and aero-engine factories of the country, a strain which is being met on the whole in a satisfactory manner.

The difficulties in connection with production are aggravated by the competing claims of many different types of aero-engines. Standardization is the ideal but it is obviously difficult of attainment having in view the importance of not losing time in production and at the same time of keeping abreast with the very latest developments necessitated by the need for constant increase of horse-power and higher performance. The Air Council are most keenly impressed by the need for concentration on a few approved engines, and they have the whole question of the reduction of numbers of types under constant and careful considration.

Attention was drawn, on more than one occasion, by manufacturers to the importance of maintaining the interest of workers in aircraft factories in the highly important but generally monotonous work on which they are employed. Engaged, as they frequently are, on the production by a repetition process of some small part of an aeroplane, these men and women find it difficult to realize that they are contributing effectively to one of our most valuable instruments of warfare. It was accordingly arranged that Captain Ewart, R.F.A., well known as a writer by the name of "Boyd Cable," should visit various squadrons at the front and gather materials and photographs for lectures concerning the exploits performed with various types of aircraft for delivery to the workpeople engaged on the manufacture of those particular types. Captain Ewart delivered several series of lectures which, judging from the reports received from the factories concerned, proved a very great success.

Commend Naval Air Work

Washington.—The Committee of the House of Representatives appointed for investigation of conduct and administration of naval affairs, commends the naval aircraft construction work performed. That part of the report bearing upon aircraft reads as follows:

"We have examined the naval aircraft situation and find many matters of great interest, but much of our information is not now open for public discussion.

This was the one development of material which no amount of foresight would have enabled the navy to prepare adequately. The growth of aeroplanes and seaplanes has been so rapid that nothing short of actual war conditions would insure a large number of up-to-the-second machines with aviators trained to handle them.

"In the earlier stages of its undertakings the naval air service met many discouragements, but the perfection of the liberty motor and the use of large sums of money in conjunction with the army to finance manufacturers have, under the direction of the air service, produced results that now promise to meet the requirements of this important branch of the navy.

"The aircraft program is in charge of Capt. Noble E. Irwin, and we commend to the entire committee the careful reading of his hearings, and especially a recent interesting and informing report made by him, now on file with the secretary of the committee."

The report filed by Captain Irwin with the committee is not available for public information because of military reasons. The hearing of Captain Irwin by the Committee on Naval Affairs developed the following information:

The Navy Department considers it undesirable to build more rigid dirigibles and is manufacturing only the non-rigid types made of cloth, inflated like a balloon and without metal or woodwork. The fuselage of the car attached to this type is like the fulselage of a War Department aeroplane.

The rule in connection with establishment of training schools for fliers is to limit them 90 machines because more than that number creates great possibilities of collisions in the air.

The advanced training schools are separated from the preliminary training schools and include instruction in bomb dropping and gun fire.

The sizes of the aeroplanes change so frequently that new hangars have frequently to be constructed.

Propellers Coming from Milwaukee

Milwaukee.—A large plant for the manufacture of propellers for aeroplanes, hydroaeroplanes and similar craft has been established in Milwaukee by the United States Aero Propeller Co., organized by the same interests owning and operating the Great Lakes Boat Building Corp. W. C. Morehead is president and general manager of both companies, which jointly occupy the boat works and shops at 333 Becher Street, Milwaukee. The new company is working on large Government contracts both for the army and navy departments.

Coffin Examined in Aircraft Investigation

Washington.—Howard E. Coffin, recently chairman of the Aircraft Production Board, was examined by Charles E. Hughes and Assistant Attorney General Frierson at the Department of Justice, in the aircraft investigation. Mr. Coffin's examination occupied most of the day, and Attorney General Gregory himself was present the greater part of the time. Neither Mr. Coffin nor the investigators would discuss the inquiry. Mr. Coffin left the Department of Justice in his usual good humor, and apparently had not been seriously affected by the investigation.

AERIAL AGE
WEEKLY

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Official photograph of a squadron formation taken from one of the military aeroplanes

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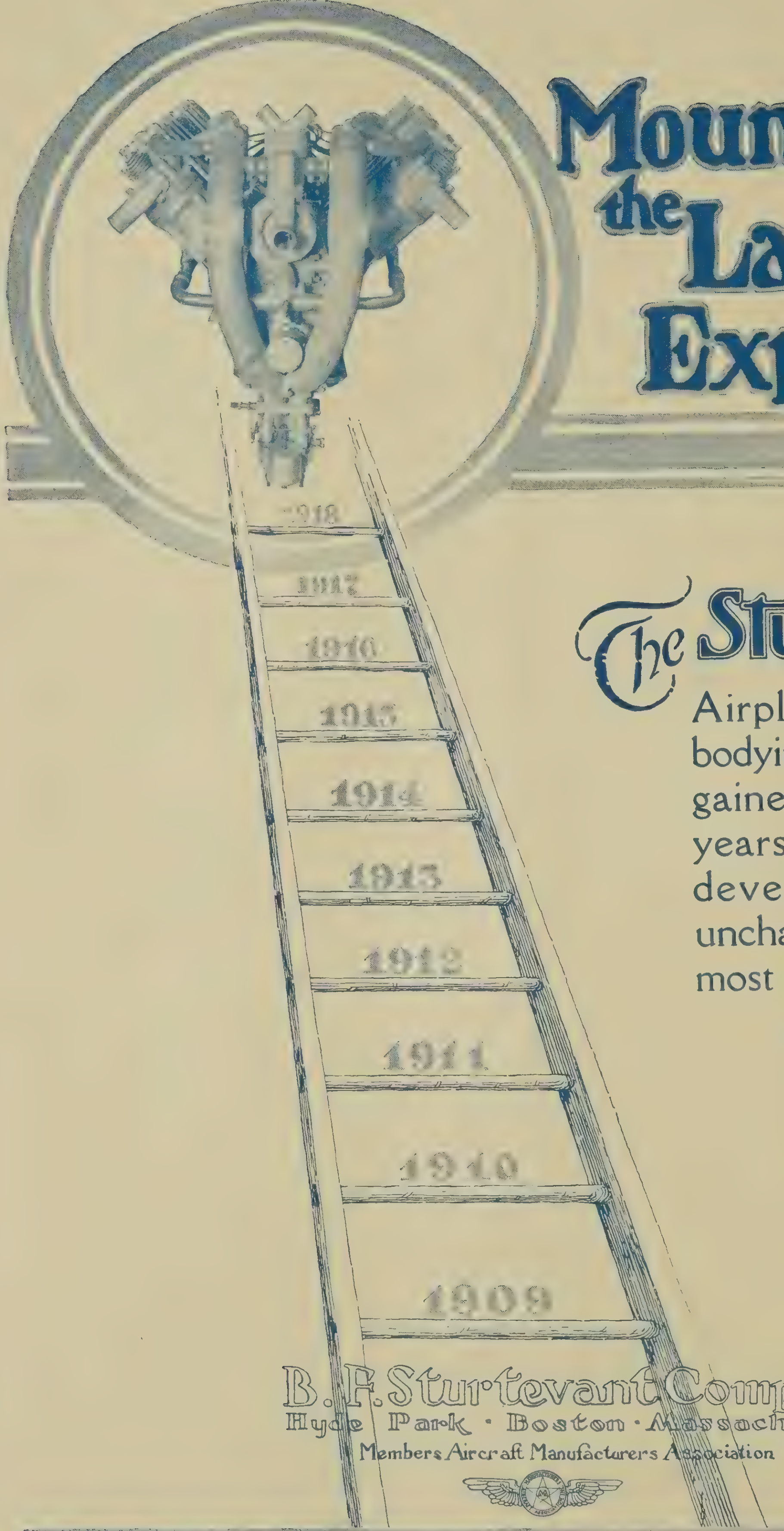

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AMERICA'S FIRST ACHIEVEMENT IN PROVIDING BOMBING AEROPLANES

DURING the past week America's first bombing aeroplanes were launched successfully. On July 4th was launched the first American-built Caproni, a biplane, equipped with three Liberty Motors. On July 6th was launched the first American-built Handley-Page, also a biplane, equipped with two Liberty Motors. Both machines were built by the Standard Aircraft Corporation. In both cases the tests were successful and we can anticipate that in the near future bombing machines of these types will be turned out in large numbers, and that America will truly begin to be a substantial help to the Allies, aeronautically, just as we have been of great assistance to the Allies in connection with land operations.

The Launching of the Caproni

The final test flight of the Caproni biplane and the handing of the machine over to the Government took place at the Government Aviation Field at Mineola, Long Island, on the morning of July 4th. There was no formality about it. The plane had had its engines installed at the aviation field and when this had been completed and the engines tuned up, Lieut. Gino, who met his death only a few days later, stepped into the plane and took her into the air for its final test. The machine had been tested several times previously. The performance of the plane is said to have been entirely satisfactory both to the builders, the representatives of the Italian firm, and to the representatives of the Government. The figures as to height and speed are not available at the present time.

Major Tappi, head of the Italian aviation mission to this country, and Major Falchi, of the Italian air forces, represented their country at the experimental flight. Mr. John D. Ryan, Director of Aircraft Production, and General William L. Kenly, Director of Military Aeronautics, and Colonel H. H. Arnold, W. C. Potter of the Aircraft Board, Captain Harvey of the administrative staff of the Mineola aviation field, and Majors Rhinehart and Canady were present at the launching. Captain Hugo d'Annunzio and Lieutenant Belloni represented the Caproni company. Commander Briggs represented the British Government.

Alan R. Hawley, president of the Aero Club of America, said:

"The success of the first American built battleplane is one of the most important steps forward in the building of our air fleet."

In connection with the flight, a cablegram was made public which was recently received by the Italian mission from Captain Fiorello La Guardia, Congressman from New York, who joined the American aviation forces and is now in Italy. Captain La Guardia appeals for the dispatch to Italy of raw materials for the building of aircraft. After expressing his good wishes for the success of the Italian mission he says:

"Please urge the American Government to send to Italy raw materials with which to build aeroplanes. The new type of Caproni war 'plane is a powerful machine, and its success has been proven in the flight from Turin to Rome, in which I participated. Give us raw materials and we will build thousands of aeroplanes here, and our American boys can whip the enemy off the map."

The Launching of the Handley-Page

The giant Handley-Page, with a wing spread of 100 feet and driven by twin Liberty motors of 400 horsepower each, took the air at 4:30.

Without its cargo of bombs, the machine weighs 9,000 pounds, or four and one-half tons, and to drive it requires fuel consumption of approximately sixty gallons an hour. The Liberty motors are in an armored compartment on either side of the fuselage. In addition to its bombs, the machine also mounts two light Browning machine guns, which can be fired from any desired angle.

The pilot was Lord William Semphill, of the British service, and the man who sat in the machine gunner's seat forward was Major General William L. Kenly, U. S. A., Chief of the Department of Military Aeronautics in Washington. The others in the aeroplane were Captain E. T. Waller, of the Canadian Army; Captain E. L. Austin, of the Royal Flying Corps; Young B. Dawkins, an official of the Standard Aircraft Corporation, and an official moving-picture photographer.

Christened "The Langley"

The aeroplane was christened in honor of Langley by Mrs. Harry Bowers Mingle, wife of the President of the Standard Aircraft Corporation.

After leaving the ground at 4:30 the plane made three wide circles, climbing higher each time. It landed at 4:52. Colonel Sempill said it reached a height of 3,500 feet and maintained an average speed of ninety miles an hour.

The "launching" and test were preceded by a luncheon at the plant, to which several hundred guests were invited. Secretaries Daniels and Baker were invited, but were unable to attend. Benedict Crowell, First Assistant Secretary of War, represented the War Department. Senator J. J. Frelinghuysen of New Jersey and Senator Charles S. Thomas of Colorado also were present.

Mineola Planes Flew Over

Two Curtiss training machines flew over from the aviation field at Mineola just before the ceremony. One of them carried General Brancker, of the British Air Forces. Major Rhinehart and Captain Hawley of the Mineola school were the pilots.

Mr. Mingle presented Assistant Secretary Crowell, who expressed the regrets of Secretary Baker, who, he said, was most anxious to witness the flight. He said America was in a position to feel confidence in the outcome of the war, but warned against overconfidence, a mistake into which the Germans fell.

"Our aircraft program is going forward," said Mr. Crowell, "and it will gain impetus as the days pass. And I am confident that the men and women behind the machines will stand to their colors to the victorious end of the great war."

John D. Ryan Speaks

John D. Ryan, director of aircraft production in the United States, followed Secretary Crowell.

"It is a matter of great pride to me," said Mr. Ryan, "to be here today and to witness the launching of this splendid machine, an aeroplane that is British in design and American in construction. The raw materials were all grown in America, the engines were built in America, and the men and women who did the building are Americans. The launching of the machine is an earnest of what the United States is going to do in the future to promote aircraft program.

"This aeroplane is one of the most powerful ever built. It is a type of plane that is driving the Hun behind his own lines, the kind that is keeping him there, and also the kind that is destroying the things behind his lines on which he depends to defeat our boys and those of our allies. And I am glad to tell you that thousands just like this one are under construction, all to be driven by the Liberty motor, the best and the most powerful aeronautical engine ever built. We are now furnishing Liberty engines to our own aeroplane manufacturers, and England, France and Italy have called on us to furnish Liberty motors to them for installation in their own planes. The production of the aeroplane in quantity is easy, but that of the aeroplane engine is another matter. The number of aeroplanes in the last analysis is the number of engines to drive them.

Expected Too Much

"There has been great dissatisfaction expressed by the people of the country at the results attained up to the present in the production of aircraft. Some of it has been warranted—most of it has been caused by expectations beyond the possibility of performance.

"I can speak with knowledge on this subject because I have for two months studied every cause of delay and disappointment, and I can speak freely, because no stretch of my conscience will let me claim any credit for what has been done up to the present day. My connection with the work of aircraft production for the army has been so short that nothing I have done or left undone could possibly have affected the accomplishments at this time.

"Much good work has been done by my predecessors, and I am taking this opportunity to assure the people of the country that, in my opinion, there has been no such delay with the work or anything like such incapacity of those in charge as has been indicated in some of the criticisms of the accomplishments, or lack of them, in production. A few facts will, I think, bear me out.

The Liberty Engine

"In the fifteen months we have been at war there has been designed and put into production the Liberty engine, which is acknowledged by all of the Allies as one of great performance and a distinct contribution to the cause. As a powerful machine to drive heavy aircraft, it is undoubtedly as satisfactory as any engine produced by any nation on either side of the war. There were produced here in our workshops during the months of May and June just past as many of these engines as Great Britain produced of all types of aeronautical engines in the entire year of 1915, at the close of which she had been seventeen months at war. Including other types of aircraft engines, there were more produced in our shops in the month of June than Great Britain produced in the whole year of 1915.

"The representatives of Great Britain's Air Ministry here today have verified these facts, and consider the performance very satisfactory, in view of the fact that prior to our entrance into the war almost nothing had been done here, except by private enterprise, to prepare for aeronautical engine design or production.

Engine Production

"The limiting factor in our production program, as in that of every nation in the war, is engines. The planes proper can be made in any number required, but no nation has yet been able to furnish engines in the quantities needed. All the Allies are today looking to us—calling to us—to furnish Liberty engines to drive their planes and promote their air programs. Two of the best of foreign types of engines have been put into production here in quantity, and are now going overseas to drive planes being built in France and England for our air forces, as well as being supplied for planes we are building here to be shipped abroad.

"We have in course of development another foreign engine of high power, and facilities have been provided for its production in quantity. We are now loading on almost every ship sailing for France large planes equipped with engines and every accessory to fit them for service as soon as they can be assembled on the other side. We have in order and in production a large number of planes of the type you saw flown here today, and the other proven types of large fighting planes are being started in production.

Not 10,000 Airplanes in All

"The people of the country have been carried away with the talk of tens of thousands of fighting and bombing aeroplanes, and have been impatient when they have heard of the few we have produced so far. There never have been 10,000 aeroplanes on either side of this war at any one time, and until within a month, if even now, there have not been 10,000 on all sides and all fronts of the war added together.

"We must learn to think and talk of things we want to win with in the quantities that can be furnished and in the time required to furnish them. We will have aircraft in type, in quantity, and quality to accomplish what we have set out to do—to win the war. We have set that as our mark and in the way of our progress there may be delays and disappointments—but no failure. The men and women who are bending their efforts to make our air forces supreme will have the reward of victory—victory in the air and in the war.

"Our allies have secured and maintained supremacy in the air, and America will add to that such preponderance that no doubt may be felt of the result we have set ourselves out to attain.

"The facilities for the manufacture of aircraft engines and planes are being developed with all speed and skill available—that we now have entered the production stage gives assurance that the country and its Allies will soon realize the benefit of such a fighting air force as will satisfy our people and bring consternation and defeat to our enemies."

Ready to Fly and Fight

General Kenly talked next. "It is my pleasure," he said, addressing the hundreds of working men and women who stood about him, "to congratulate you on turning out the first Handley-Page ever built in America. I consider it an honor, as head of the Department of Military Aeronautics, to accept this splendid machine. We appreciate thoroughly what you are doing for your country, and I am happy to inform you that we are now ready to fly and fight all the machines that can be turned out in the United States.'

General Brancker, who had arrived at the field a few minutes before in an army machine from Mineola, the machine driven by Lieutenant Hardy, U. S. A., followed General Kenly.

Gen. Brancker Speaks

"We in Europe," he said, "France, Belgium, Italy, and England, have been fighting for nearly four years now. Throughout that period we have maintained superiority in the air, but the drain has been great, and we cannot go much further. Neither can Germany go much further, and for the same reason.

"In America you have resources that are unlimited. Than your aviators there are none better. I have seen them in England, and in France, and I speak with first-hand knowledge. We are now trying to build up an air force which will carry the war into the very vitals of Germany, and the type of machine which is destined to cross the Rhine is the type you see before you here.

Liberty Motor Praised

"And now a word about the Liberty motor. It has been much criticized. In England we have been backing it for nine months, and we are building a big program, and in those machines we are using the Liberty motor. I have a cable in my pocket now which will make our American comrades tremble, for in that cablegram I am delegated to ask them to let us have still more Liberty motors, and have them before the end of this year. The Liberty motor is a success. You may be assured of that.

"And in conclusion may I be pardoned if I suggest that none of us be too optimistic. I think that our accursed optimism has been the cause of a great deal of our trouble. This is a hard and a long war, and it is not going to be won until every one of us is doing his utmost in whatever capacity he or she is best fitted to make the right end possible."

Sir Joseph Fowler, of the British Mission, also had a good word to say for the Liberty motor. He had just returned from a tour of American aeroplane plants.

"What we witness here today," he said, "is an earnest of what is going on all over this country, and we are going to get from the United States what is going to give us an overwhelming superiority in the air. And I want to say that the Liberty engine is one of the finest aeronautical motors ever built. No engine was ever more appropriately named, and it delights me to see the spirit in which the men and women who are building the Liberty motor are working."

Other Speakers

Senator Frelinghuysen spoke next. "It is an eye for an eye and a tooth for a tooth," the Senator said, "and it is the airship like this one which is going into the hinterland of Germany. These machines will win the war, and, if necessary, we are going to drive the Hun from the face of the earth."

"This event," said Senator Thomas, "is an epoch. It is an indication of what America intends to do to win this war." Senator Thomas closed by saying that he hoped the Allies would give Germany the same kind of treatment that Germany would like to give the Allies.

After the trial of the Handley-Page, Lord Simphill made a flight in the De Haviland scout machine. He struck bad ground when he landed, and the machine was overturned, but the pilot escaped unhurt.

Others Present

Among those present were: Mr. Henry A. Wise Wood, Rear Admiral Bradley A. Fiske, President of the U. S. Naval Institute; Colonel H. H. Arnold, Lieutenant Godfrey L. Cabot, President Aero Club of New England; Mr. Evan J. David, Business Manager of *Flying;* Lieutenant H. K. Black, R. F. C., Associate Editor of AERIAL AGE; Mr. N. E. Jennett of *Flying,* and Mr. Sherbondy.

SIR WILLIAM WEIR, BRITISH AIR MINISTER, ENDORSES LIBERTY MOTOR

"TESTS which recently have been applied in France and this country to the latest American engine have justified the prediction that it would prove a most valuable contribution to Allied resources, and the United States can go ahead and push its production with every confidence."

Those are the words of Sir William Weir, new Secretary to the Air Ministry, who presided at the Wilbur Wright lecture delivered by Dr. Durand, scientific attaché of the American Embassy, in the Central Hall at Westminster. In thanking Mr. Durand for his lecture Sir William said the lecturer's suggestion would be studied by all technical members of the government and by all engaged in the application of aeronautical science to manufacture.

Sir William then paid tribute to the skill, ingenuity and technical capacity of the aircraft designers of Great Britain. The new policy of intrusting pure design to the industry itself has been very successful.

Great Progress Made

Great as was the advance in aeronautics in the first two years of the war, he said, the last year had marked even greater progress. The rate of advance was being accelerated.

Sir William thought he could define the Allied technical position in relation to the enemy by saying the Allied technical superiority at the present time was equal to the superiority in the human qualities of skill, enterprise and endurance displayed by Allied pilots.

"The progress and development of the air department were so rapid," said Sir William, "that we were never content with our existing situation or unduly confident of our future efforts, but today we have a solid foundation of full and wholehearted coöperation by the United States upon which to rest assured of the future. In this bitter struggle the United States has stimulated our hearts and fed us from the day she declared war.

"In the assistance given us in aerial warfare," he continued, "the United States has already rendered us a very great aid in the way of personnel. Reports of the work of American pilots have already appeared in the press. Their officers and men have won golden opinions from all with whom they have come in contact. It is the universal opinion that they are unsurpassed in their energy and modesty, for their willingness to learn and their desire to coöperate in everything. So far as personnel is concerned, we entertain the fullest confidence in the future success of the American air force.

Assured of Material

"With regard to material, we may now begin to speak with equal confidence. Tests which have been recently applied in France and in this country to the latest American engine justify us in predicting that it will prove a most valuable contribution to the Allied resources. The United States can go ahead and push the production of this motor with every confidence. The results of the experiments so far obtained have placed the engine in the very first line of aeromotors. It is well understood that some criticism will be directed against the slowness of production of these motors during the last three or four months, but I would like to point out that a considerable interval will, and always must, elapse between the experimental and commercial production of any new motor.

"Every engine, even the best designed and in a country with the greatest resources and facilities, cannot escape a period of what may be called 'teething troubles' before the motors can be produced on anything like a large scale. The Liberty engine is, accordingly, an example of what the Allies might expect in the matter of aircraft production from the scientists and designers of America whom Mr. Durand represents.

"The various methods of utilizing aircraft in warfare are growing rapidly, so rapidly that it is perfectly clear that, even with all the help America can give, the fullest demands which could be made to fulfill all the different functions of aircraft will never be met during the war. We will always require more aircraft, with personnel, than can be possibly supplied today."

The News of the Week

Eighteen American Aviators Show Battle Formation

A remarkable demonstration of military formation flying was given on July 4th by three squadrons from the Mineola army air station. They flew over New York City in American planes in formation and presented the most thrilling feature on America's Independence Day programme.

Major C. K. Rhinehardt, commanding officer of the First Provisional Wing, led the splendidly knit squadron on its Fourth of July flight, and putting his command through maneuvers, stirring and faultless, brought convincing proof to the thousands of delighted civilians in the streets below that America in the air was prepared to live up to the brightest traditions of the American soldier and sailor. This air fleet was a fighting fleet, disciplined and letter perfect.

The squadron took off at the Mineola field and went into battle formation over Belmont Park. Crossing to Manhattan, it flew with even and accurately held formation to Van Cortlandt Park; turned there and followed the Hudson and Riverside Drive to Grant's Tomb, where it broke formation, and then the individual pilots went through a long sequence of "stunts" by far more thrilling than any mere fireworks display could have been. Thousands stared at this daredevil mastery of the upper air until every muscle in their necks strained and ached.

Capt. F. H. Harvey, Harvard, 1918, officer in charge of flying, First Provisional Wing, was second in command of the crack flying corps, which, by its public exhibition, thrilled the public of New York for several hours. Lieuts. Davidson, Roullot and Boggs were the flight leaders. The squadron was all-American from its pilots to the last strut and rivet in the machines.

Capt. Boyriven, French adviser to the First Provisional Wing, joined the squadron, flying an American-made scout painted in deep green, and this machine he put through every "stunt" in the manual of the air-fighter. A large Caproni machine also joined in the remarkable celebration, as well as a British aero piloted by Captain J. F. Morris, the British ace, who has 29 German machines to his credit.

There were three formations of six machines that flew over New York. They were preceded by two scouts, one piloted by Captain Boyriven, another by Lieutenant Jones. They landed in Van Cortlandt Park in the morning and joined the formations in the afternoon.

The most remarkable spectacle was presented when the formations reached the Hudson and the formation broke at 5,000 feet and formed again at 2,000 feet. This was repeated over Herald Square.

The squadrons also volplaned down to circle around the French, British and American ships on the Hudson.

The energetic leader, Major C. K. Rhinehardt, and his able assistant, Captain Harvey, made a landing at Van Cortlandt Park.

Gen. Kenly Named for Aircraft Board

Washington, July 6.—The ex-officio membership on the Aircraft Board formerly held by the Chief Signal Officer of the army, has been transferred under executive order to the Director of Military Aeronautics, Major Gen. William L. Kenly. A War Department statement announcing the order to-day says:

"A chief of the air service will not be detailed so long as the Bureau of Aircraft Production is operating as a separate bureau."

Appointment of Major B. H. Gitchell, National Army, as chief of the Industrial Relations section of the Aircraft Production Bureau was announced.

Messrs. Hawley and Woodhouse Called by Senate

Alan R. Hawley, president, and Henry Woodhouse, member of the board of governors of the Aero Club of America, have been asked by the Senate Committee on Aircraft to go to Washington to confer with the committee. The invitation came from Senator Charles B. Thomas, chairman, and from Senator James J. Reed, of the Senate Committee on Aircraft. Senator Thomas's telegram was as follows:

"The Committee on Aircraft will be glad if you will give it the benefit of your suggestions on Monday about 10 o'clock at the room of the Senate Committee on Military Affairs, Capitol building."

Senator Reed stated that the committee is anxious to do everything possible to speed up the production of aircraft and lead to the building of air forces large enough not only to fight the Germans but to win the war.

Major John Purroy Mitchel, ex-Mayor of New York, who lost his life in an accident on July 6, while flying at the Gerstner Field

Unveiled Tablet

Madison, New Jersey, celebrated the National Holiday extensively. Among other events was the unveiling of the bronze tablet as the memorial of Annabel Scharff Roberts, the first citizen of Madison and the first American army nurse to give her life for her country in France. The Tablet was placed in the Public Library of Madison.

Representatives from the allied forces attended the ceremony, being, Captain R. Baffrey, of the 102nd Regiment of the French Artillery, Lieut. H. K. Black, R. F. C., C. F. A., representing the British Army, and Lieut. Marcel Saive, representing the Belgian Army.

The dedicatory address was made by President McCracken, of Vassar College. During the ceremony, under orders from the War Department and in recognition of Miss Roberts' services to her country, Major Thomas Hitchcock, and Lieut. Harold Wilson flew aeroplanes from Mineola aviation field over the spot.

Vienna Air Mail to Budapest

The Hague.—The *Pester Lloyd* publishes an interview with the Hungarian Minister of Commerce respecting the new postal air service between Budapest and Vienna, which starts on June 27th.

The Minister said that the difficulties of delivering telegrams in Budapest had compelled him to establish a postal air service between Budapest and Vienna which would be the first civil postal air service between these cities.

The dispatch of mail from Budapest is started between 4 and 5 P. M. The return dispatch from Vienna begins the next morning, the arrival taking place between 7 and 8 A. M. in Budapest. The mails will be conveyed from the place of arrival to the general Post Office by motor car.

Special stamps are to be issued for this service. The stamps show the Parliament buildings and bear an inscription.

Besides this service there will be established within six weeks a new air postal line in Hungary. There is already such a line between Vienna, Lemberg, and Kiev.

Airmail Rates to be 16 Cents

The aeroplane mail rates are to be lowered to 16 cents. "What goes up must come down," said Postmaster General Burleson, and, figuring that the aerial mail could cut rates as well as corners, he issued a statement a few days ago announcing the change.

Hereafter one's correspondence that goes "as the crow flies'" will flutter along at an altitude of 16 cents instead of the present level of 24 cents.

This will make a rate of 6 cents for the first ounce, and the usual ten cents for special delivery, with 6 cents more for each additional ounce or fraction of an ounce.

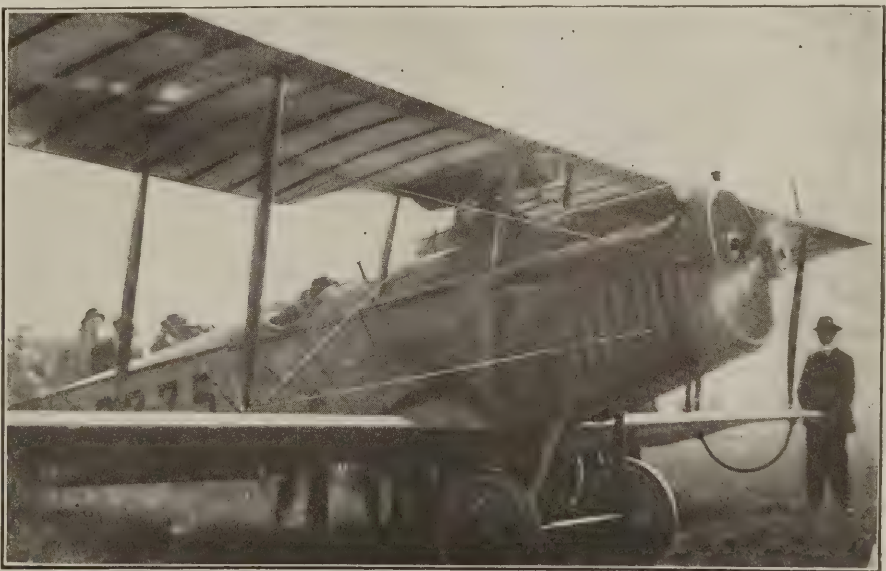
And, incidentally, the service is improving daily. Try it by sending an aeropost letter daily!

"Keep Off" Signs of Switzerland

Following upon the last violation of Swiss neutrality by the bombing of Porrentruy by unknown aviators, the Swiss Government has proposed to the belligerents that the Swiss frontier be marked at night by elevated colored lights. France and Germany, it is reported, have already given favorable replies.

Increasing Effectiveness of Anti-Aircraft Artillery

Aerial progress has not been confined to the air, for anti-aircraft artillery, if it can be considered as part of aerial activity, has advanced by leaps and bounds of late. At present it is a common occurrence to hear that an enemy machine has been brought down by anti-aircraft fire. Typical of this advance is the case of the 10th Section of French anti-aircraft artillery of the mobile type, which, during the period from September, 1915, to December, 1917, alone bronght down 13 German aeroplanes. During the period from February 11th to 20th, last, the anti-aircraft artillery of the French army brought down four machines. In each case the number is based on official recognition, which means that the destruction of each enemy machine was established beyond doubt.



The Hispano-Suiza motored Curtiss biplane used for aerial mail carrying

Aerial Mail Envelopes Bring $10,000 for Athletic Equipment

Three envelopes sent by aerial mail and presented to Mrs. Charles A. Van Rensselaer, chairman of the National Aeronautic Committee, by Mr. Alan R. Hawley, president of the Aero Club of America, brought $10,000 for athletic equipment. The auction took place at Oyster Bay while twenty aeroplanes in thrilling exploits were viewed by several thousand persons gathered on the estate of Mortimer L. Schiff on Saturday afternoon, July 6th, to assist in raising $52,000, to provide athletic and musical equipment for all the aviation training camps in the United States. It is believed about half the sum was obtained.

While the throngs were gathered on the lawns the aeroplanes from Mineola, twenty miles away, appeared. The aviators went through various stunts and then changed to conflict formation and staged a "fight" over the hills and waters of the bay. Following this one machine darted away from the others and went to a height of about 10,000 feet. There the aviator did the spiral, falling leaf, step-ladder, vrille, tail spin and banking.

Leonard in Glove Bout

The aeroplanes then formed again and flying hardly fifty feet over the tree tops dropped copies of "The Star-Spangled Banner" to the crowd.

Mr. Schiff had erected may tents and in each there was entertainment of varied nature. Sam Harris was in charge of the vaudeville bill, which included Private Irving Berlin, from Camp Upton; Dorothy Jardon, Eddie Wynn, Jack Hazard, Mollie King, Donald Brian, Jane and Katherine Lee and several soldiers from Camp Upton.

Benny Leonard, the lightweight champion, boxed with "Dutch" Brandt and "Young" Eddy, both privates at Camp Upton. There were bayonet combats between instructors and men of the army and Allied armies.

Burr McIntosh auctioned off a letter sent by the first mail aeroplane. It brought more than $3,000. Original drawings also sold for high prices.

Many Notables Present

Among those present were Major General and Mrs. Franklin Bell, Rear Admiral Wm. N. Little, U. S. N.; Brigadier General W. A. White, Captains D'Annunzio and Volomie of the Italian army, Lord and Lady Wellesley, Lieut. Santiago Campuzano, Commander Blackwood, Captain Bath, Walter J. Salmon, Mr. and Mrs. Henry Sanderson, Mr. and Mrs. F. L. Hein, Mrs. Henry Duryea, Mrs. Charles A. Van Rensselaer, Mrs. Edward W. McKenna, Mr. and Mrs. Irving Brokaw, Mr. and Mrs. H. P. Davison, Mr. and Mrs. Henry P. Shonnard, Mr. and Mrs. J. Harriman, Mr. and Mrs. George Baker, Mr. and Mrs. C. H. Goddard, Mr. and Mrs. Clinton Gilbert, Mr. and Mrs. E. F. Hutton, Mr. and Mrs. Frank Remington, Mrs. Charles B. Alexander, Mrs. Thomas Hitchcock, Mrs. Burke Roche, Augustus Post, Mrs. John S. Phillips, Captain Spinola and Colonel Binda of the Italian army, and Mr. and Mrs. Henry L. Batterman.

Mrs. Herbert M. Harriman, Mrs. Joseph W. Harriman and her daughter, Miss Miriam Harriman; Mrs. W. M. Fleitmann and Miss Lida L. Fleitmann, Mrs. Frederic R. Coudert, Mrs. William Laimbeer and her son, Mrs. Julian Peabody, Mrs. Barger Wallach, Mrs. Nelson B. Burr, Mrs. Ansel Phelps, Mrs. Morton Schwartz, Mr. and Mrs. Frank C. Henderson, who were with Mr. and Mrs. James Lowell Putnam; Mrs. Le Roy Baldwin and her daughter, Miss Lucile Baldwin, the latter being with the Misses Katherine and Ellin Mackay; Miss Madeleine Liebert and her sister, Mrs. Neustadt; Mrs. Sidney Fish, Mrs. Whitewright Watson, Mrs. Oliver Bird, Mrs. I. Townsend Burden, Miss Evelyn Burden, Mrs. William H. Erhardt, Mrs. George Rose, Mrs. Charles A. Van Rensselaer, and many others.

Aeroplane Postal Service to Corsica

According to the Paris daily press, an aerial postal servcie will soon be organized between Nice and Corsica, and it will be carried out by the use of hydroaeroplanes. The landing place in Corsica has not yet been fixed, but it is likely that Ajaccio will be chosen for the purpose, it being the terminal of the railroad line, and besides it affords a very good landing place for hydroaeroplanes. The distance to be covered in a straight line is about 150 miles. A great advantage will be secured by the present service, for it will allow of carrying all the ordinary letters, while the packages classed as mail matter will be transported by boat as usual. A postal hydroaeroplane of improved type will carry upwards of 450 pounds of mail on each trip. Letters will arrive in Corsica in much less time than before, for the trip can be made in a few hours.

Aero Post Among Allies

Latest advices are that aerial postal communication will soon be established between the Allies. Such a method of communication would connect London, Paris, Nice, Rome and Brindisi. Gen. Bongiovanni, head of the Italian aviation, is fathering the plan.

Du Pont Gives Y. M. C. A. Aeroplane

New York—Irenée Du Pont, head of the Dupont interests at Wilmington, Delaware, has presented to the School for Aeroplane Mechanics, conducted by West Side Y. M. C. A., of 318 West Fifty-seventh street, New York City, a complete aeroplane, which is to be brought here for the use of the school. F. F. Tenney, principal, and W. D. Davis, instructor, have gone to Claymont, Del., to inspect the gift and bring it here, in the air if practicable, to save transportation. The plane is a Curtiss J.N.-4 military tractor biplane. Mr. Du Pont's letter announcing the gift says among other things: "We have concluded, in view of the national importance of your school, that we will make a donation of the machine to you."

The School for Aeroplane Mechanics has grown so rapidly since it was opened last fall that it has been necessary to rent additional quarters. Part of the building at 240 West Fifty-third street has been in use from the beginning and is in operation from 8 A. M. till 11 P. M. daily except Sunday. In June, 221 students were enrolled, a total of 921 for the seven months. The new quarters are at 239 West Fifty-sixth street. The plane instruction will be given here, the old school being devoted to engine work. The new arrangement will double the capacity of the school, which was started when the government made its appeal for competent machinists to care for the fighting plane fleet building, and is run at cost as a patriotic service.

Part of the Aero Mail Mechanical staff at Belmont Park. Left to right, upper row: Albert Pfaff, Assistant Motor Mechanic; Raymond Heck, Chief Mechanic and Sergeant; Raymond Toole, Supply Sergeant; Albert Sutton, Assistant in Charge of Transportation; D. Bugois, Motor Expert. Lower row, left to right: James Edmonds, in Charge of Transportation; I. Bielis, Electrician; J. Wallmark, in Charge of Wings and Woodwork.

Wardrop Leaves for Europe

G. Douglas Wardrop, Editor of AERIAL AGE, left an Atlantic port last week for Europe, where he hopes to make a personal study of the aircraft situation at first-hand for the benefit of the readers of AERIAL AGE.

He will return early in the Fall and it is expected that the results of his investigation, and the interviews, and the editorial material which he will bring back will have immense significance for the American aeronautic industry.

Ensign Potter Gets First Seaplane

Ensign Stephen Potter, United States Naval Reserve Force, who was killed in action on April 25th, is credited with shooting down the first German seaplane destroyed by an American naval aviator. Photographs, taken from a seaplane, showing the enemy plane in flames and in the water, have been received by the Navy Department.

A report of this action states that on a long distance reconnaissance of the German coast was made by large American flying boats operating from a British Royal airforce station. Two American naval aviators accompanied this expedition and one of them, Ensign Potter, was successful in shooting down a German seaplane which attacked the formation. A second enemy machine was put to rout at the same time. After making a highly successful reconnaissance flight, the seaplanes returned to their base, having sustained but slight damage.

Aeroplane Mail Hours

Aeroplane mail will be received daily except Sunday for Philadelphia and Washington at the postal stations in New York City up to ten minutes before the hours of leaving:

	A. M.		A. M.
G. P. O.	10:50	U	10:20
A	10:35	V	10:30
B	9:47	W	10:25
C	10:35		
D	10:20	Y	10:30
F	10.30	College	10:05
G	10:35	Fox	8:26
H	10:25	G. Cent.	10:55
I	10:20	H. G.	10:00
J	10:20	Hud. Term.	10:45
K	10:25	M. Sp.	10:30
L	10:20	Penn Term.	11:15
M	9:52	Times	10:40
N	10:30	Tomp	9:40
O	10:35	Tremont	8:06
P	10:20	Wall	10:20
R	8:43	Wash	9:46
S	9:53	W. F.	8:15
T	8:35		

Ordinarily letters despatched by aeroplane are in the hands of the addresses in New York and Washington at approximately 4 P. M., and in Philadelphia at 2:30 P. M.

Patchogue Flier Honored

Patchoque, L. I.—Mr. and Mrs. Seward S. Smith of this place have received word confirming the report of their son, Kenneth R. Smith's achievement in sinking a U-boat from a seaplane, and stating that as a reward he has received from the French Government the Croix de Guerre, and will be appointed to a Junior Lieutenancy in the aviation service.

MOVE TO PROTECT BOSTON

Anti-Aircraft Guns to be Emplaced in the Public Garden

Boston, July 8.—The War Department asked and obtained permission today to locate anti-aircraft guns on the Boston Public Garden. The plan is to build concrete emplacements near Arlington Street and Commonwealth Avenue, and the work will be done under the direction of the Engineers Corps.

Mayor Peters notified the Park and Recreation Board of his approval of the plan.

The AIRCRAFT TRADE REVIEW

Building New Addition

Ground has ben broken for the new addition to the Doehlers Die Casting Company's Brooklyn factory on Court and Huntington Streets. It will cover 30,000 square feet and will be ten stories high, actually doubling the present capacity of the plant. Construction will be of steel and concrete. It will be ready for occupany before the summer is over.

Opening a Foreign Department

The Esta Company, manufacturers of the Esta water auxiliator have opened an export department at 106 Fulton Street, New York. Several large contracts which have recently been closed have necessitated this.

Commercial Aeronautics in Siam

The first annual general meeting of the shareholders in the firm of Barrow, Brown & Co., Ltd., the well-known firm of merchants, who have supplied aircraft material in the past to the Siamese Flying Services, took place at the Company's office in Bangkok, on March 9th, Mr. W. A. Graham being in the chair.

The directors' report and balance sheet were adopted, and a dividend declared of 10 per cent. for 1917. The report showed that in addition the position of the company has been strengthened by ample reserves.

Mr. Brighouse was re-elected a director, and Mr. Leatherbarrow was also voted a member of the board. Mr. Donaldson was re-appointed auditor.

Mr. A. Huetter Now Vice-President and General Manager

Mr. A. Huetter, efficiency engineer who is a well-known personality among his colleagues and who is formerly of Chicago, held the position as superintendent for a number of years with the Boonton Rubber Mfg. Co., of Boonton, N. J.

About two years ago a call to Dayton, Ohio, resulted in a position as head of Delco Bakelite department, from which he resigned on April 1, 1918, to take up his duties as Vice President and General Manager with The Premier Rubber & Insulation Co., of which he is the founder.

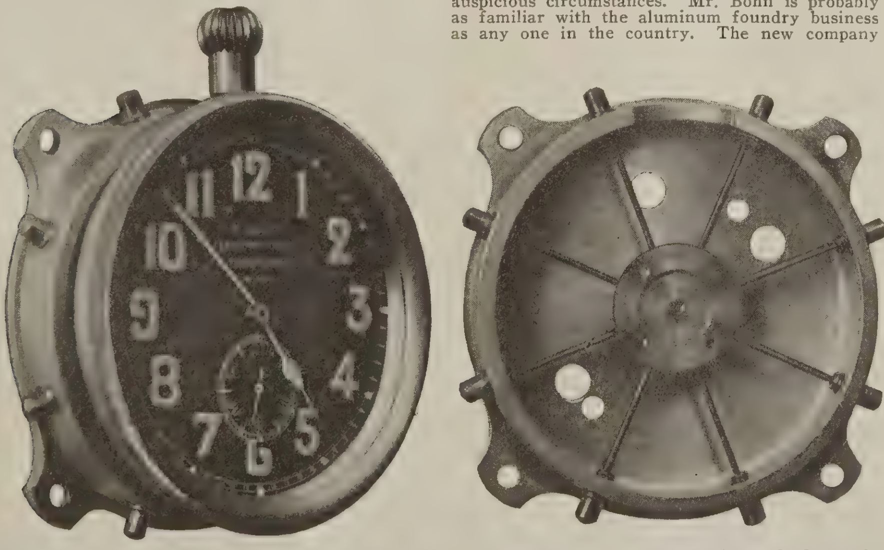
Property was purchased in North Dayton and a plant completed April 1, 1918. The plant consists of a one-story brick building, 68′ front by 100′ depth with its own power house. The floor space is divided into three main departments. First—tool room, second—hard rubber moulding and vulcanizing and third—Bakelite moulding.

In the Bakelite department, moulded insulation is being produced. This insulation is used for starting, lighting and ignition systems for the aeroplane and automobile.

Mr. Charles Bohn, formerly of the Aluminum Castings Company, of Cleveland, who has organized the Chas. B. Bohn Company of Detroit

Charles B. Bohn, one of the pioneers in the making of aluminum castings in this country, and for the past ten years a prominent factor in the Aluminum Castings Company, of which organization has was General Manager, has withdrawn and has organized his own company, The Chas. B. Bohn Foundry Company.

Mr. Bohn withdrew from the Aluminum Castings Company on April 15, 1918, shortly thereafter organizing and incorporating his own company under the laws of the State of Michigan, capitalization being $300,000, all common stock, and all of which has been paid in. The new company has started in business under most auspicious circumstances. Mr. Bohn is probably as familiar with the aluminum foundry business as any one in the country. The new company has located itself, at least for the present, in the buildings formerly occupied by the Motor Castings Company, on Hart Ave., Detroit. The foundry, which has been used for the production of iron castings, has been converted into one entirely suited for production of aluminum castings on a very large scale. Extensive alterations have sometime since been completed, and several new units are in process of construction, which, when completed, will make this foundry one of the largest ones in Detroit, and in the course of a very short time, the production of this new plant will be approximately fifty thousand pounds aluminum and brass castings per day. The units in process of construction will embody several distinctive features, which Mr. Bohn has based on his experience of approximately twenty years in the industry.



One of the most efficient shock absorbing devices designed to mount aeroplane clocks and aeronautical instruments, has just been imported by A. Wittnauer & Company, of New York. The device is protected by Swiss patents and, as will be seen by the accompanying illustration, is a marked improvement on former holders due to its simplicity, strength and compactness

Among the features in the technique of the melting of metal, Mr. Bohn introduces for the first time in the Aluminum Castings Industry, the use of the Electric Furnace.

Mr. Bohn first entered the foundry industry when he became Secretary and Treasurer of the Central Brass Foundry in Cleveland, in 1902. Later the name of this foundry was changed to the name of Allyne Brass Foundry, of which organization he became Vice President. About this time the foundries were experimenting with the castings of aluminum, but a great many of them, finding so many difficulties in the way, gave up the idea entirely, and predicted that the making of aluminum castings would never be a commercial success. Mr. Bohn persisted on the other hand that the aluminum could be cast commercially, and in due course this foundry was able to solve the difficulties that were being enocuntered, and succeeded in perhaps first producing commercial aluminum castings. In the course of time, this organization developed and a foundry was erected in Detroit, Mr. Bohn then removing to Detroit, and becoming Vice President and General Manager of the new company. In due course the Aluminum Castings Company was formed, this company combining several small and separately owned plants in the one organization. Mr. Bohn became General Manager of the Aluminum Castings Co. in 1912, which post he has occupied up to the time of his withdrawal in April.

Mr. Bohn, in addition to being President of the Chas. B. Bohn Foundry Company, is Vice President of the Mich. Smelting and Refining Company, and Peninsular Refining Company, both of Detroit; and Treasurer of the Lake Erie Smelting and Refining Co., of Cleveland, and the Detroit Electric Furnace Co.

Change in Name

Owing to the confusion with other business names of a like meaning, the Automotive Parts, Inc., have decided to change the name of their corporation, and will hereafter be known as The Automotive Sales Company. Their requests to be allowed to make the change has been granted under the Michigan laws.

Aero Engine Production

The Willys-Overland Company produced more than one thousand aeroplane engines in May. The war profits of the company for the year may reach $8,000,000.

John Willys has said that twenty planes and four flying boats are produced daily by the Curtiss and Overland Companies.

A New Corporation

A new aeronautical corporation which has just been formed is the Crescentini Airship Corporation, of Manhattan. It is capitalized at $100,000. Its officers are Messrs. F. C. Haven, G. Doyle, and L. Cresentini. Their offices are at 149 Broadway.

To Settle Aviator's Estate

Surrogate Fowler yesterday granted the petition of Mrs. Susan E. Mansfield of New London, Conn., mother of the late George Gibbs Mansfield, known as Richard Mansfield, 2nd, for letters ancilliary to settle his estate. Young Mansfield, a son of the actor, was killed in a flying accident at Fort Sam Houston, Texas, April 3.

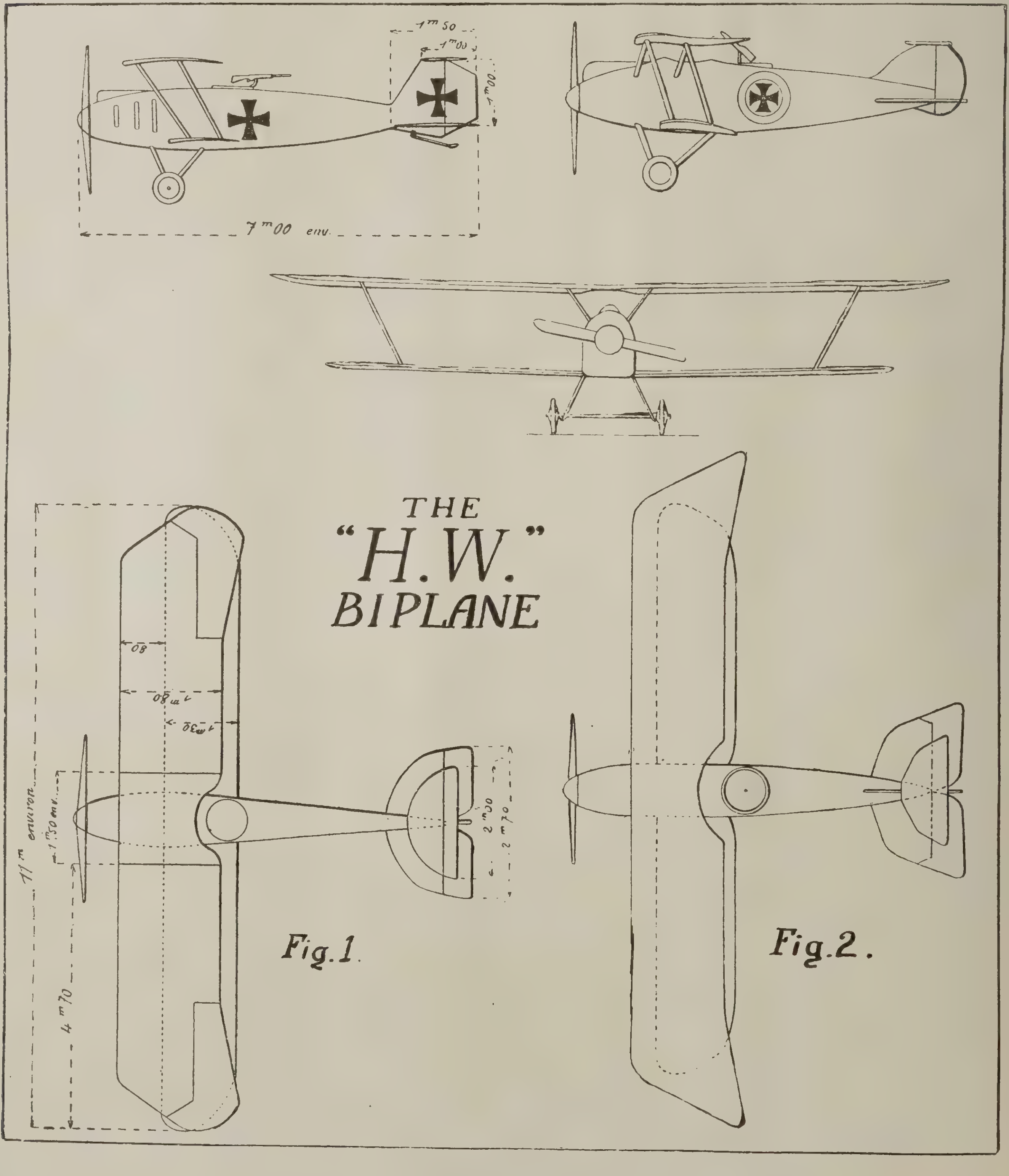
Mrs. Mansfield states in her petition that she is the mother and legatee of the estate of the dead aviator and that at the time of his death they were both residents of New London. The will was probated there. It disposes of an estate valued at approximately $14,000, of which $13,000 consists of property in New York City.

A GERMAN "MYSTERY" BIPLANE—THE H. W.

Occasional reports have been received from France regarding a new type of German machine, having a biplane tail. These reports have differed as to the exact shape of the machine, but all agreed regarding the biplane tail. One of these machines has been **brought down in** France, but, unfortunately, the description of this machine is not as complete as could be desired, owing to the fact that the only machine which has been examined closely was rather badly wrecked, behind the Allied lines.

The only clue as to the identity of the machine appears to be that it was marked "H. W.," which initials are variously interpreted as "Halberstadt Werke" and "Hannover Werke." The description given herewith, obtained from a recent issue of *Flight* and *L'Aerophile,* will no doubt be later supplemented with more complete information.

A reconstruction of the H.W. biplane has been attempted, based on the wreckage of one of these machines brought down on the French front, where it was badly burnt. This reconstruction takes the form shown in the accompanying sketch. The H.W. biplane is a two-seater. The span of the upper wings is approximately 11 metres, and of the bottom wings about 10 metres. The wings have a dihedral angle but no sweep-back, and are staggered. The upper wings are of trapezoidal plan form with balanced *ailerons,* the trailing edge of which is extended, giving somewhat the appearance of the old Taubes. The lower wings are also of trapezoidal plan form, but



THE "H.W." BIPLANE

Fig. 1.

Fig. 2.

have the rear corners rounded off.

On each side of the *fuselage* there is one pair of inter-plane struts, sloping forward in conformity with the stagger and also sloping outward as shown in the front view. These struts are in the form of stream-line steel tubes.

The tail is of the biplane form, the top plane of it being considerably smaller than the bottom one. We have already indicated the armament: two machine guns, one in front and one behind. We may add that certain machines of this type have been fitted with bomb racks, while another was equipped with a camera. This is natural as the machine belongs to the C class (general utility). The accompanying sketches illustrate the differences between the different versions.

The plan form of the wings is almost definitely determined, but the *ailerons,* which have rounded tips in the diagrammatic reconstruction, come to a point in the sketch drawn by Lieut. Mussat. In the first case the tail plane is rounded and the fin and rudder of polygonal contour. The contrary is indicated in the letter from *Flight's* correspondent, who says: "I insist in particular on the following points: The *fuselage* is very deep, and the top plane is very close to it. The contour of the rudder and its fin is very rounded and *not* polygonal as in the reconstructed view. The tail planes are polygonal in plan view, with the angles rounded off."

In reconstructing the machine the length of each top wing was found to be 4 metres 70 from root to tip. The span found for the bottom wing was in the neighborhood of 11 metres, and as, according to all the observers who have had an opportunity of seeing the machine, the bottom plane was of smaller span than the top one, it was concluded that there must have been a fixed centre section in the top plane. No trace has, however, been found of such a centre section.

Flight's correspondent calls attention to the deep *fuselage* close to which is the top plane. On the other hand a contributor, Jean Lagorgette, who, from the hospital, follows closely any novelties, advances the following hypothesis: If there was a fixed centre section it would probably be made of steel tubes, and in that case have survived the flames. If no trace has been found of it or of its *cabane* this centre section does not exist, and the top wings attach directly to the body as in the Roland.

In any case, the *fuselage* being high, the rear gunner would be able to fire upwards. According to observers on the ground this machine is very fast and has a high "ceiling."

THE PFALZ SINGLE-SEATER FIGHTER

Among the more recent German single-seater fighters there is one which up to the present has received little attention, although it is employed to a considerable extent by the enemy. We are referring to the Pfalz scout, of which *Flight* published a brief description in a recent issue, by the courtesy of the authorities.

In outward appearance the Pfalz scout is chiefly remarkable on account of the fact that it imitates as do the recent Albatros scouts, the wing bracing originated by the Nieuport firm, incorporating a larger top plane and a smaller lower plane. The type is frequently termed by the Germans a one-and-a-half plane. The wing bracing differs, as regards the inter-plane struts, from that of the later type Albatros single-seaters in that the lower ends of the struts do not meet at a point, but are connected by a short horizontal member. The lower plane has two spars according to usual practice, although these are placed rather close together, thus forming in reality a compromise between the single-spar lower plane of small chord and the ordinary two-spar lower plane with chord equal to that of the top plane.

The Pfalz follows Albatros practice in that the upper wing runs right through, and is in one piece. This construction is possible on account of the fact that no dihedral angle is given to the wings. The top plane is mounted on struts sloping outward from the body.

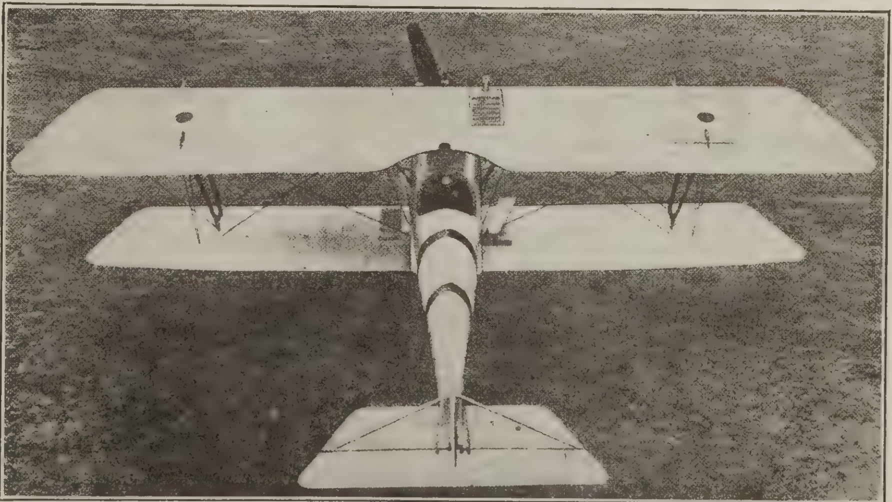
The attachment of the lower wing to the body is interesting. Instead of the attachment usually found there is on the Pfalz scout a short wing root, built integrally with the body, to which the lower spars are secured. In order to attain this the three-ply covering of the body has a reflex curvature at this point, from the convex curve of the body to a concave curve gradually merging into the shape of the wing section. There can be little doubt that this has been done in order to minimize resistance, but whether or not it achieves this purpose to any considerable degree may perhaps be open to doubt.

The body of the Pfalz single-seater is of elliptical cross section and appears to be of comparatively good stream-line form. It is deep so as to allow only just the top of the pilot's head to project outside, and to bring the top plane down low so as to obstruct the view to a lesser extent. It is narrow so as to allow the pilot a good view downward, the narrow overall width being rendered possible by the adoption of the semi-monocoque construction.

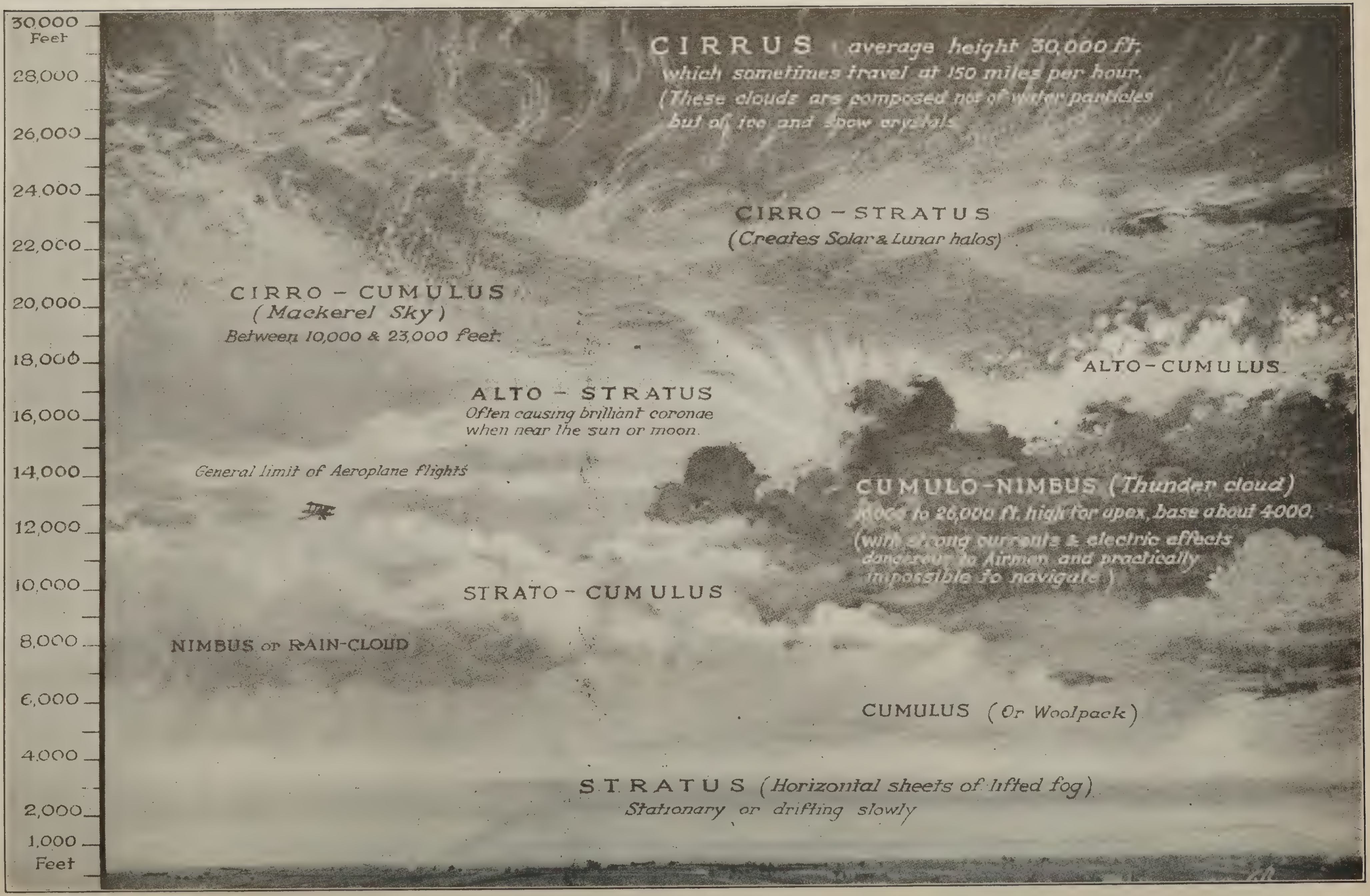
Although being in general principle similar to the Albatros construction the body of the Pfalz differs somewhat in the manner of applying the ply-wood covering. Whereas that of the Albatros is put on in short rectangular sections, each covering only one span between adjacent body formers, the covering of the Pfalz is in the form of two thicknesses of three-ply, each in the form of long narrow strips put on diagonally, the strips of the inner skin and those of the outer running at approximately right angles to one another. It would appear that this form of construction is of some advantage, inasmuch as difficulty is always experienced in getting three-ply wood to bend to a double curvature. A sheet of three-ply may be readily bent along one axis, but even a very thin sheet will protest if one tries to bend it in addition along an axis at right angles to the former. The fact is, therefore, almost certainly at the bottom of the Pfalz construction. However, this is a subject to which we hope to return later.

To the casual observer the tail planes of the Pfalz do not present anything of particular interest, but a closer examination reveals the fact that the tail plane appears to be put on "the wrong way round." That is to say, it has a flat top surface and a convex bottom surface. As far as is possible to judge from a somewhat hurried inspection, the tail plane is not set at any angle of incidence to the line of flight—either positive or negative—and one would therefore rather expect that during a steep dive the tail plane would exert a somewhat excessive righting force tending to "flatten out" the machine rather abruptly. This is so unusual in a German machine, where frequently the tail plane is set at a positive angle of lift, as to give food for some speculation.

The engine fitted to the Pfalz scout in question is a 160 h.p. Mercedes, which, as the accompanying photographs show, is neatly covered in with the exception of the extreme top of the cylinders. We have at the moment no figures regarding performance, but in view of the evident low resistance of the body the speed may safely be assumed to be fairly good.



View from above of the German Pfalz single-seater fighter, showing rudder construction

30,000 Feet
28,000
26,000
24,000
22,000
20,000
18,000
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14,000
12,000
10,000
8,000
6,000
4,000
2,000
1,000 Feet
CIRRUS average height 30,000 ft. which sometimes travel at 150 miles per hour. (These clouds are composed not of water particles but of ice and snow crystals.
CIRRO - STRATUS (Creates Solar & Lunar halos)
CIRRO - CUMULUS (Mackerel Sky) Between 10,000 & 23,000 feet.
ALTO - CUMULUS.
ALTO - STRATUS Often causing brilliant coronae when near the sun or moon.
General limit of Aeroplane flights
CUMULO-NIMBUS (Thunder cloud) Rises to 26,000 ft. high for apex, base about 4000. (with strong currents & electric effects dangerous to Airmen and practically impossible to navigate)
STRATO - CUMULUS
NIMBUS or RAIN-CLOUD
CUMULUS (Or Woolpack)
STRATUS (Horizontal sheets of lifted fog) Stationary or drifting slowly

PROBLEMS TO BE SOLVED TO SUCCESSFULLY OPERATE AIRCRAFT ON SCHEDULE TIME BETWEEN POINTS OF DEPARTURE AND TERMINAL

THE military authorities in charge of the Aerial mail lines, together with the Postal authorities and the Aero Club of America officials have held a number of conferences to define the problems to be solved and the possible way of solving them.

When the aerial mail line started there was no data available regarding meteorological conditions and the ways and means of overcoming the difficulties created by changing weather conditions.

The following authorities participated in the various conferences:

Captain Charles Andrew Willoughby, A. S. S. C., in charge of the Aerial Mail Service for the Army; Captain B. B. Lipsner, of the Lubrication Division, Department of Aeronautics, U. S. Army; Second Assistant Postmaster General Otto Praeger, Louis C. Boldenweck, superintendent of the Aerial Mail Service; Alan R. Hawley, President, and Henry Woodhouse, Member of the Board of Governors, Aero Club of America; Augustus Post, Secretary, Aerial League of America; Lieut. Torry H. Webb, Lieut. Paul Culver, Lieut. C. H. Miller, Lieut. James C. Edgerton, Lieut. Steven Bonsal, Lieut. J. Kilgore, Richard Vreeland, Assistant Superintendent of Mails, of New York; George L. Conner, Chief Clerk to Mr. Praeger; and Mr. Harry L. Hartung, representative of the Post Office Department at Belmont Park; Professor Charles Lane Poor, and Captain Robert A. Bartlett.

We printed in the last issue the outline of the problems to be solved to successfully operate aircraft on schedule time between points of departure and terminal. We print herewith the table of weather conditions during the first month of Aerial Mail Service prepared by Mr. Boldenweck, the Superintendent of the Aerial Mail Service.

No. 1—Conditions en route Philadelphia from Washington, D.C.
No. 2—Conditions en route Washington, D.C., from Philadelphia

Month	Pilot	Fair	Fog	Wind	Storm
May 15	1 Boyle	Clear		N NE 8 Mi.	
	2 Edgerton	Clear		N NE 8 Mi.	
16	1 Edgerton x	Clear		E Light	
	2 Edgerton x	Clear		E Light	
17	1 Boyle	Clear		E to SE Light	
	2 Miller	Clear		E to SE Light	
18	1 Miller	Clear		S Light	
	2 Culver	Clear		S Light	
20	1 Edgerton	Cloudy		S SW Light	
	2 Miller	Partly cloudy		S Light	
21	1 Miller	Cloudy		S Light	Showers
	2 Edgerton	Clouds		S Light	Electric storms
22	1 Culver	Light haze		SE 8 Mi.	Showers
	2 N. F.	Clouds		S SE 30 Mi.	Showers
23	1 Edgerton	Clouds	Light fog	S SE 30 Mi.	Light showers
	2 Miller	Clouds		S SE 25 Mi.	Light showers
24	1 Miller	Clouds		SE 25 Mi.	Showers
	2 Edgerton	Light haze		S SE 25 Mi.	
25	1 Killgore	Haze		S Light	
	2 Miller	Partly cloudy		S Light	Light showers
27	1 Edgerton	Clouds	Heavy fog	S Light	Showers
	2 Killgore	Clouds	Heavy fog	S Light	Showers
28	1 Miller	Clear		S SW 8 Mi.	
	2 Edgerton	Partly cloudy		S Light	
29	1 Killgore	Light haze		S E Light	
	2 Culver	Partly cloudy		S SE Light	
30	1 N. F.	Clouds	Heavy fog	S Light	
	2 N. F.	Partly cloudy	Light and heavy fogs	S Light SE	
31	1 Culver	Clouds	Light fog	S SE Light	
	2 N. F.	Clouds	Light fog	S Light	Showers
June 1	1 Edgerton x	Clouds	Light fog	S SE Light	Showers
	2 Edgerton x	Partly cloudy		S Light	Showers
3	1 Edgerton	Light haze		SE Light	
	2 Bonsal	Clouds		S Light	
4	1 Bonsal	Clear		SE Light	
	2 Edgerton	Clear		SE Light	
5	1 Edgerton	Haze		S SW Light	
	2 Killgore	Clear		S Light	
6	1 Edgerton	Low haze		W Light	
	2 Bonsal	Clear		W Light	
7	1 Killgore	Clouds		SW Light	Showers
	2 Edgerton	Clouds	Low fog	SW 15 Mi.	Showers
8	1 Bonsal	Clear		NE 15 Mi.	
	2 Killgore	Clear		N NE 15 Mi.	
10	1 Edgerton	Partly cloudy		S SW 10 Mi.	
	2 Bonsal	Partly cloudy		S SW 10 Mi.	
11	1 Killgore	Cloudy		SE Light	
	2 Edgerton	Partly cloudy		E Light	
12	1 Bonsal			S SW 25 Mi.	
	2 Killgore	Clouds		SW 25 Mi.	
13	1 Edgerton	Light haze		NW 25 Mi.	
	2 Bonsal	Clear		NW 30 Mi.	
14	1 Killgore	Cloudy		NE 15 Mi.	
	2 Edgerton	Partly cloudy		NW W Light	
15	1 Bonsal	Clear		SW Light	
	2 Killgore	Clear		N NW Light	

x—Round trip.
N. F.—No flight.

No. 1—Conditions en route Philadelphia from New York.
No. 2—Conditions en route New York from Philadelphia.

Month	Pilot	Fair	Fog	Wind	Storm
May 15	1 Webb	Clear		NE E 8 Mi.	
	2 Culver	Clear		E NE 8 Mi.	
16	1 Bonsal	Haze, light		E Light	
	2 Webb	Clear		SE Light	
17	1 Culver	Light, haze		S Light	
	2 Webb			S SE Light	
18	1 Bonsal x	Clear		E Light	
	2 Bonsal x	Clear		E SE Light	
20	1 Webb x	Hazy		South, strong	
	2 Webb x	Light clouds		South, light	
21	1 Bonsal	Clouds	Thick	SW Light	Electric storms
	2 N. F.	Clouds		S Light	Electric storms
22	1 Bonsal (Returned)	Clouds	Thick	S to SE Light	
	2 N. F.	Clouds		S Light	Showers
23	1 Bonsal	Haze and fog		S SW Light	
	2 Bonsal	Cloudy		S Light	Light showers
24	1 Webb	Light haze		S SE 8 Mi.	
	2 Culver	Light haze		S 10 Mi.	
25	1 Bonsal x	Light haze		S Light	
	2 Bonsal x	Partly cloudy		S Light	
27	1 N. F.	Clouds	Thick	S Light	Light showers
	2 Webb	Clouds	Fog low	S SW Light	Showers
28	1 Bonsal	Clouds		W with squals	Showers
	2 Miller	Clouds		SW Light	
29	1 Bonsal	Clear		NE E Light	
	2 Miller	Clear		E Light	
30	1 N. F.	Clear	On coast,	NE Strong	
	2 N. F.	Partly cloudy	Thick clouds	E Light	
31	1 N. F.	Cloudy	Thick fog on coast	S Light	Light showers
	2 N. F.	Cloudy	Low fog	S Light	Showers
June 1	1 N. F.	Haze		SW Light	
	2 Killgore	Cloudy		S Light	
3	1 Miller	Light haze		NW Light	
	2 Culver	Clouds		W Light	
4	1 Killgore	Haze		W Rough	
	2 Miller	Clear		SW Light	
5	1 Webb x	Low haze		W Light	
	2 Webb x	Clear		W Light	
6	1 Miller	Low haze		S SW Light	
	2 Culver	Clear		S SW Light	
7	1 N. F.	Clouds	Low fog	SW 24 Mi.	Thunder show.
	2 N. F.	Clouds	Low fog	SW 24 Mi.	Thunder show.
8	1 Culver	Clear		NE 25 Mi.	
	2 Miller	Clear		NE 25 Mi.	
10	1 Miller	Partly cloudy		SW to W 8 Mi.	Thunder show.
	2 Culver	Partly cloudy		SW to W 10 Mi.	
11	1 Miller	Clear		NE E Light	
	2 Miller	Clear		E Light	
12	1 Culver	Clouds, light haze		W 35-40 Mi.	Rain
	2 Culver	Clouds		W 35 Mi.	Showers
13	1 Webb	Clear		NW 45 Mi.	
	2 Webb	Clear		N NW 30 Mi.	
14	1 Webb	Light haze		N Light	
	2 Webb	Clear		N NW Light	
15	1 Miller	Light haze		N NW 10 Mi.	
	2 Miller	Clear		NW 10 Mi.	

x—Round trip.
N. F.—No flight.

HIGH FLYING AND THE HEIGHT OF VARIOUS TYPES OF CLOUD

The height at which clouds are riding on any particular day is of the greatest interest and importance to the air pilot. When he looks out at the sky in the early morning his estimation of the conditions which meet his eye will be qualified by the work which lies before him. If his work is direct downward observation and photographic record taking he will not mind very much the cloudy or misty appearance in the distance; but if artillery spotting is the order of the day, his opinion of the weather will be uncomplimentary, for that haziness will prevent proper observation. If the work consists of a long-distance raid he will look for different conditions. Sometimes the presence of cloud at a low altitude is useful as a screen or shelter to which to fly. In the above cloud diagram we see stratus, which may be otherwise described as horizontal sheets of lifted fog, at 2,000 ft. Above is some cumulus, or woolpack cloud at 5,000 ft. At 8,000 ft. is some nimbus, or rain cloud. At 10,000 ft. is some strato-cumulus. At 12,000 ft, is a mass of Cumulo-nimbus, dangerous to aerial navigators. Still higher is some alto-stratus, and still higher, at 20,000 ft., is the cirro-cumulus, which causes what is known as the mackerel sky. The two highest types of cloud are the cirro-stratus and the cirrus, composed of ice particles. It will be seen from the above that the aerial ocean which aviators navigate is of very varied character in its different layers. It is a much more variable and subtle medium than the ocean of water.

The drawing illustrating different cloud formations published on the opposite page is reproduced by courtesy of the *London Sphere*.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Dallas, Tex.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Lyles, Tenn., take station and wire D. M. A.

Note 3—Report to Waltham, Mass., take ation and wire District Approvals Officer, 480 Lexington Ave., New York.

Note 4—Report to Eastman Kodak Co., Rochester, N. Y.

Note 5—Report to Middleton, Pa., Aviation Gen. Supply Depot.

Note 6—Report to Officer i/c Production Dept., Grand Central Palace, 46th Street and Lexington Ave.

Note 7—Report to District Manager of Equipment, Chicago, Ill.

Note 8—Report to Fort Kamehameha, Honolulu, Hawaii.

Note 9—Report to Radio School, Austin, Texas.

Note 10—Report to Signal Corps Recruit Depot, Fort Wayne, Mich.

Note 11—Report to Aerial Mail Station, Bustleton, Pa., and wire D. M. A.

Note 12—Report to Swissville, Pa., Union Switch and Signal Co.

Special Orders, Nos. 142-146, Inclusive

A

Ainsworth, Cyril	FRF
Adams, Cedric S	GLC
Asp, Melvin B	FRF
Anderson, Edwin F	BST
Adams, John F	CGC
Alton, Darrell D	EOT
Abel, W. E	BST
Ainslee, James E	FLT; SMM; FRF
Anderson, Lee N	VBW
Anderson, Harry William	SLR; PFO
Alexander, Robert P	FRF
Abernathy, Claude S	FRF

B

Buell, Harry G	HHN; SRC; Note 1
Barnard, Albert	FRF
Berg, Carl Leslie	SLR; KST
Burns, Edward	DMA
Bisgood, Frederick W	FRF
Bagnell, Edgar W	EOT
Brugman, William J	VBW
Blackburn, Ernest W	FOB
Bartlett, Charles O	SAG
Bishop, Albert B	CWT
Bassford, Curtis A	FRF
Biggs, Frederick P	FRF
Baxter, Robert K	FRF
Bird, Byron	VBW
Boyle, Robert D	FRF
Brown, Cyrus P	FRF
Baker, Harry S	BST
Brokaw, John A	PFO
Bruch, Louis M	PFO
Bowman, Charles Elmo	SLR; ELA
Bell, Robert W	PFO
Burr, Walter A	PFO
Barnard, Albert	BST
Brown, Harold L	FRF
Brown, Ralph E	PFO
Broms, Clarence S	PFO
Bruner, Donald L	EOT
Barnes, Robert H	BST
Baum, Frank H	LHV
Barkelow, Samuel W	CGC
Black, Howard	BST
Burke, George W	FRF
Bach, Albert	EOT
Barlsdale, Julian N., Jr	EOT
Brown, Egbert D	CGC
Begeman, Myron L	BST
Brown, Henry J	FRF
Barnhart, Leroy W	SLR; AAD
Boyce, William Henry	REV
Bernard, Clifford S	FRF
Brown, Raymond J	PFO
Boos, Walter Percy	SLR; AAD
Beau, Lucas V., Jr	SLR; AAD
Batty, John H	FRF
Balsley, Horace C	FRF
Bowen, Joseph Brown	SLR
Bassford, Curtis A	SMM
Bailey, John Madison	SLR
Babcock, Henry S	SLR; FRF; DIK
Bouquet, Uric L	FLT; SMM; FRF
Baker, Harold H	FRF
Brunner, Charles F	LHV

The Commanding Officer of the Signal Corps Aviation School at Columbia, and his Staff. Captain Joseph Sears, the Commanding Officer, is shown in the center foreground

Brubaker, Lawrence	FLT; SMM; FRF
Burger, Fairfax Carter	SLR; AAD
Budd, Denison Merrill	SLR; LDT
Brew, George Joseph	FLR
Braymen, Kenneth C	FRF
Blewett, Gideon Albert	SLR; KST
Burnard, Norman Thomas	SLR; LDT
Boxell, Earl E	FRF
Brennan, John Patrick	SLR
Burns, John Vernon	SLR
Babcock	Note 8
Boehm, Herbert L	Note 3
Bernhard, William	Note 10

C

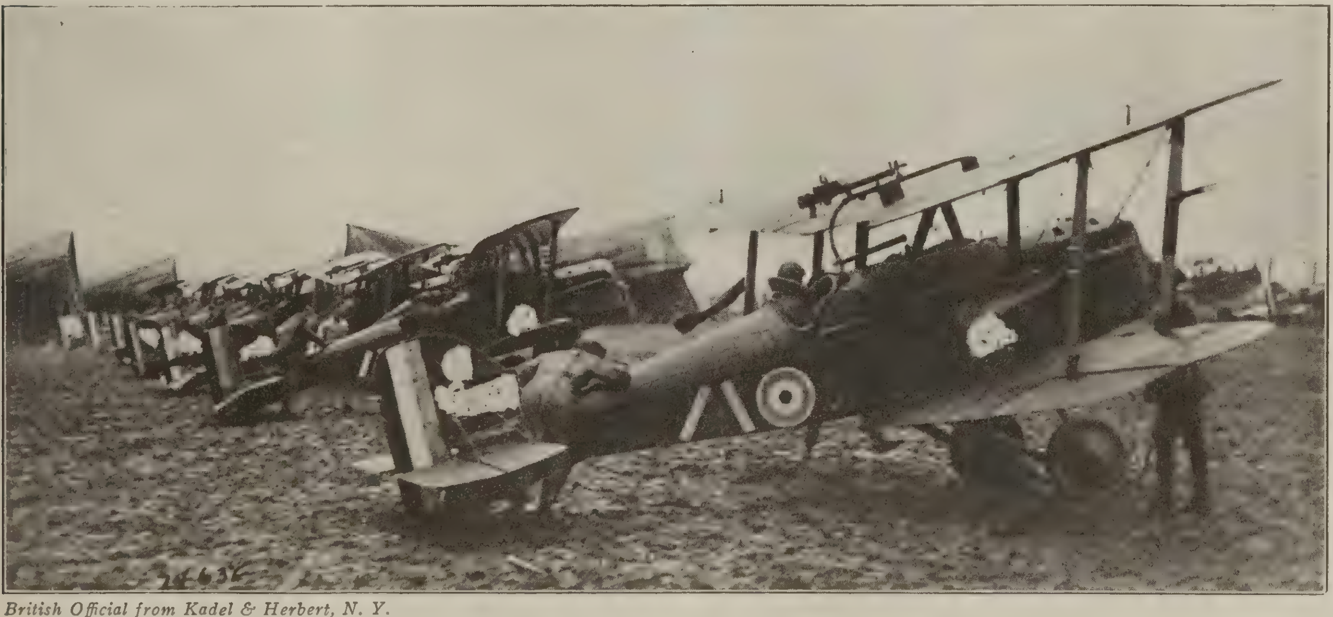
Cronin, George H	SLR
Campbell, David S	VBW
Cole, Harold D	FRF
Crane, Percy F	VBW
Cochrane, Earl C	FRF
Conner, Richard M	FRF
Conlogue, John A	FRF
Cooper, Ralph E	FOB
Cutler, Sewall	DMA
Clark, Walter D	FRF
Cheney, Christopher A	DMA
Cabell, Philip F	FRF
Cook, Ray C	FRF
Clark, William H	FRF
Chester, Andrew E	FRF
Clemmey, Francis W	VBW
Cornell, George C	FRF
Cutler, Harvey D	FRF
Cathcart, Donald G	FRF
Callis, Louis E	FRF
Campion, John L	CGC
Colliver, Harry F	FRF
Cartwright, Paul	FRF
Carroll, John J	VBW
Clark, Ralph S	CGC
Coleman, Wiley L	CGC
Conway, Cornelius M	LHV
Chamberlain, Leo W	FRF
Cook, William L. S	PFO
Crook, Wilson W	PFO
Chapman, George H	CGC
Claxton, Willis L	CGC
Canfield, Donald T	SBI
Carson, William L	FRF
Conrad, Max H	FRF
Clark, Roger P	CGC
Clark, Arthur T	BST
Colvin, Arthur D	FRF
Clarke, Clinton W	FRF
Corkins, Vernon G	GLC
Clark, Earland F	LHV
Costar, Lloyd	PFO
Corbet, Clinton L	PFO
Clinton, Ambrose Victor	SLR
Caldwell, Wally S	VBW
Clark, Willard S	FRF
Clark, Eugene C	FRF
Campbell, Max W	KST
Cox, Sidney H	KST
Collier, Ralph P	BST
Cowgill, John R	KST
Cooper, Forrest G	DIK
Cooper, Edwin G	FRF
Collins, Claude R	FRF
Coyle, Walter W	FRF
Croom, Marvin E	BST
Crompton, Howard	FRF
Crow, Homer L	SLR; AAD
Carrigan, Joseph Francis	SLR; PFO
Chambers, Karl Dumas	SLR; RWT
Cowen, Thomas David	SLR; CSO
Cunnea, Louis James	SLR; EOT
Calhoun, William Morgan	SLR; EOT
Collier, Henry L., Jr	FRF
Chapman, Harold C	FRF
Croarkin, Paul Cornelius	SLR; RWT
Chaplin, Winthrop L	FRF
Charroin, Arthur B	FRF
Clark, Horace	FRF
Clark, Oliver L	FRF
Camblin, Roy W	FRF
Cantey, Samuel McGowan	FRF
Chase, Leo	SLR
Cowham, Robert N	DMA; WFO; Notes 1, 4
Crowdus, Walter C	Note 8
Canfield, John P	Note 8

D

Dake, Robert E	FRF
Daniels, Julian S	FRF
D'Hodge, Wylie F	FRF
Dresser, Burtis Eugene	SLR
Dixon, Rollin Lester	SLR; LHV
Despain, Lawrence N	FRF
Dreher, Raymond Carl	SLR; LDT
Davis, Robert H	VBW
Drueding, Albert J	DMA
Davis, Claude A	FRF
Drake, Joseph H., Jr	FRF
Dreher Raymond C	FRF
Dayton, Frank E	FRF
Duffy, James W., Jr	CGC
Diller, Harry J	CGC
Davis, Charles W	BST
Despain, Lawrence N	PFO
d'Autremont, Hubert H	LHV
DeLany, Russell W	FRF
Duncan, Lee J	DIK
Day, Robert Goss	SLR; AAD
Daniel, Lloyd A	FRF
Dorris, William L., Jr	FRF
Doherty, Chester C	FRF
Dutkewich, Meletius Peter	SLT
Daley, Henry Francis	SLR
Doerr, Henry David	SLR

E

Elliott, Park	CRI
Elliott, Douglas S	CGC
Elliott, Clinton, Jr	EOT
Edwards, Duncan L	PFO
Eby, Allen D	SLT; FRF; SMM



British Official from Kadel & Herbert, N. Y.

BRITISH AEROPLANE BASE ON THE WESTERN FRONT

At this particular British base over 100 British aeroplanes are stored. They are here seen about to leave tbe ground for a raid on the Hun lines. The white spots seen scratched out were taken out by the censor as they showed the particular units to which these aeroplanes belonged

Before starting out on a bombing raid into the enemy's country. Serving out the Bombers machine gun at the "Gunroom" of an aerodrome. This is primarily for use against enemy airmen. (Official Photos)

Enloe, Robert	BST
Egelkraut, Edwin H	BST
Ewing, Henry G	PFO
Elhart, Earl W	FRF
Eagley, Karl Chase	SLR

F

Fraser, Walter	FRF
Ford, Lewis Eastman	SLR; LDT; FRF
Fuller, Clifford J	DMA
Fulton, Frank F	VBW
Fowler, Gordon	FRF
Field, Edward M., Jr	SLR
Fredlund, Frederick A	BST
Fromberg, William R	BST
Frost, Horace W	DMA
Finter, Clyde V	FLT; FRF; SMM
Faircloth, Edward C	CGC
Furman, Earl F	EOT
Foster, Henry B., Jr	CGC
Farthing, Welbourne O	FRF
Fowler, Louis F	FRF
Fickel, Jacob E	FRF
Flamman, John W	KST
Franklin, Charles B	KST
Foster, Lindsay B	SLR; AAD
Flachsenhar, Walter R	FRF
Flournoy, William Raymond	SLR; KST
Foster, Robert Hiram	SLR; PMT
Fenwick, Herbert F	FRF
Finn, Matthew E	FRF
Franklin, Roger	SLR; CRI
Finlay, William Pound	SLR
Ferree, David Scott	SLR
Foster, William John, Jr	SLR
Farnam, Julian P	Note 12

G

Gary, Will K	FRF
Gay, Ralph Ebey	SLR; FRF
Graham, Harland Brown	SLR; KST; FRF
Gandy, Robert L	EOT
Goodstein, David M	EOT
Gravely, William S	FLT; FRF; SMM
Gardner, Fred E	FRF
Green, Guy W	CGC
Goodsell, Odgen M	PFO
Garrison, Glenn G	FRF
Gary, Winder	EOT
Granger, Herman H	LDT
Gorrill, Irvan A	KST
Garrison, George G	FLR; SMM
Garesche, Edmond A	SLR; AAD
Green, Lew Abrams	SLR; RSD
Grantham, Harry Newton	SLR; RWT
Gilpin, Clifford Ernest	SLR; LDT
Green, Dwight H	FRF
Goree, Rogers Campbell	SLR; ELA
Gleerup, William W	FRF
Gassaway, Crosby Mitchell	SLR
Griswold, Clifford B	Note 6

H

Hanlon, William Jones	SLR
Harbage, Homer Benjamin	SLR; TFT; FRF
Hart, Jabez Waterman	SLR; FRF
Hartman, Clarence Arthur	SLR; FRF
Hartt, Obder Raymond	SLR
Hastings, Edward Rogers	SLR
Hickey, Frederick J	VBW
Huttig, William, Jr	FRF
Horton, Elwood	FRF
Hunt, Ralph Van Nice	SLR
Heizmann, William Albert	CPR; DMA
Heaney, Francis Clifford	SLR; ELA
Hall, George Linwood	SLR; FRF
Hinckley, Nelson Crosby	FRF
Henderson, Charles I	SBI
Henley, Harold B	VBW
Hopkins, Ward D	FRF
Hering, Coates P	DIS
Hussey, Clyde L	SLR
Hall, Clarence E	DMA
Haines, Charles H	FRF
Henderson, John S	FRF
Howard, Lynn F	FRF
Hartman, Henry B	FRF
Hardesty, Francis J	FLT; SMM; FRF
Harshaw, Myron T	FLT; SMM; FRF
Hastey, Thomas W	FLT; SMM; FRF
Harrison, Travis L	CGC
Hall, Levi M	CGC
Huffman, Charles B	TMA
Hunt, Baron L	PMT
Hovey, Justus A	FRF
Henderson, Paul R	PFO
Harvey, Robert B	FRF
Hitchcock, William C	FRF
Hewitt, Robert P	FRF
Holtzworth, Charles C	VBW
Hadley, Lawrence B	BST
Howe, Lawrence L	EOT
Harris, Benjamin T	FRF
Hogel, Milton H., Jr	DIK
Harris, Frederick R	CGC
Hill, Glenn R	CGC
Hubner, George H	CGC
Holway, Lowell H	DIK
Hands, Stanley M	BST
Hassett, Emmett A	CGC
Haller, Hubert G	VBW
Hamilton, John R	PFO
Helmerich, Walter H., Jr	PFO
Hale, John Tull	SLR; PMT
Healey, Michael V	FRF
Holloman, Barrett W	FRF
Hollander, Robert Bertram	SLR; RWT
Holmes, Raymond M	FRF
Hayes, Leslie E	FRF
Haggerty, Lyman H	FRF
Humphrey, David Edward	SLR; LDT
Healy, James A	FLR
Heffley, Armor Simpson	SLR
Howard, Robert Burnham	SLR
Hoffhaus, Henry B	Note 9

I

Isbell, Charles Woodruff	SLR
Irvine, William D	DMA
Ingraham, Elmer C	FRF
Inglesby, Joseph E., Jr	CGC
Innes, William W	LHV
Ingraham, Forrest W	FRF

J

Justice, Philip Syng	SLR; CRI; FRF
Jacobs, John Frank	SLR; KST
Jones, Vivian Maxwell	SLR; CAF
Jackson, Le Ross	SLR; DMA
Johnson, Courtlandt Spencer	SLR
Jones, Howard H	FRF
Johnson, Harry A	FRF
Jennings, George A	FLT; DIK
Jones, Ira M	FRF
Junkins, Albert S	BFT
Jolly, John C	KST
Jacobi, George N	EOT
James, John R	EOT
Jacobs, George S	FRF
Jaggard, Robert K	FRF
Johnson, Perry V	FRF
Jurden, Leonard W	FRF

K

Kennedy, William E	PFO
Kennedy, Carl E	BST
Kennedy, Robert E	FRF
Kerr, George R	VBW
Kraus, Edwin Joseph	SLR; FRF; DIK
Knox, Merton H	FRF
Kaufman, Emory B	BST
Kraft, Lawrence Fenton	SLR
Kinnebrew, Edward R	FRF; DIK
Kelly, William H	FRF
Kelly, John K	SLT; FRF; SMM
Kidder, Henry P	FRF
Kinder, Roland H	FRF
Knupp, Glenn H	BST
Kuhn, Herbert R	BST
Kober, Edgar I	CGC
Kern, Edward E	FRF
Kelbaugh, Charles H	KST
Knowlton, George E., Jr	FLT; FRF; SMM
Kear, Charles E	CGC
Kelcey, George C	EOT
Kiely, Daniel	SLR; EOT
Kimball, Francis N	FRF
Kenney, Cornelius J	FRF
Kinnebrew, Edward Robert	SLR
Keause, James W	DAP

L

Lindley, Stacey B	VBW
Logel, Joseph F	FRF
Long, William F	DAP
Lewis, Hobart H	FRF
Lyon, James L	SLR; FRF
Lowell, James R	VBW
Lyle, Fred B	CGC
Lister, Harold Reid	SLR; RWT
Luddy, Joseph Ladimore	SLR; DIK
Lewis, Chauncey G	VBW
Linkenhofer, Robert E	SLR
Lamb, Howard E	FLT; SMM; FRF
Lowenstein, Milton D	FRF
Lord, Devereux	VBW
Lull, Linford C	GLC
Lyford, Charles C	KST
Littlefield, Robert C	PFO
Lynch, Frederick D	LHV
Lane, Herbert V	EOT
Lansing, Jack C	PFO
Loughary, Ivan H	VBW
Lowe, Robert E	RWT
Lewis, Orman J	EOT
Lewis, James Otis	SLR; KST
Lowe, Herman J	FRF
Lund, Paul S	FRF
Lawson, Harry E	FRF
Lynch, Virgil Reges	SLR; Note 7

Mc

McQuown, William Karl	FLR
McCally, LaRue	SLT; SMM
McCuiston, Edward T	FRF
McCarter, Erwin L	CWT
McLaurin, King H	DMA
McKay, John Graham	SLR; FOB
McHugo, Jack R	FRF
McNeil, Guy L	BST
McCall, Ross L	FRF
McBain, Bruce	BST
MacLaughlin, Thomas G	PFO
MacMechan, Dunbar D	FRF
McEllhinney, Ralph Lamont	SLR; KST
MacEnroe, John W	CGC
MacKenzie, Clifford R	DIK
MacKenzie, Hugh F	SLR; AAD
McCarron, Henry A	FRF
McGehee, Leo Raymond	SLR; CRI
McNabb, Harold Robert	SLR; CRI
McCall, Austin J	Note 5

M

Millard, Joseph Hopkins	SLR; ELA
Metcalfe, John W	FRF
Massey, Bert V	DIK
Moreton, Amos Leon	SLR; FRF; AAD
Milyard, Raymond Calvin	SLR; LDT
Morris, Joseph T	HHN
Morris, Julian B	EOT
Moore, Herve C	FRF
Midkiff, Robert F	FRF
Muckley, Robert L	BST
Mason, Chauncey C	BST
Morey, Philip J	FRF
Manzelman, Earle Henry	SLR; RSD
Midcap, Clarence Lloyd	FLT; SMM; FRF
Meacham, Jerome F. B	GLC
Mills, Robert R	FRF
Marrs, Aubrey R	FRF
Middleton, Mortimer	FRF
Meeks, Charles C	CGC
Mitchell, Oliver F	FRF
Miller, Floyd I	KST
Middleton, Irvin B	SLR; AAD
Martin, William J., Jr	KST
Merrill, Clyde H	SLR; FRF; DIK
Mulcahey, Edward P	EOT
Miller, Marion L	BST
Mahler, James B	SLR; AAD
Miller, Ray Edward	SLR; CRI
Mayo, Francis Peltier	SLR; RWT
Merrick, Ward Sprague	SLR; CRI
Macauley, Alexander Vernon	SLR; AAD

Miller, Chauncey Stevens..........SLR; RWT
Morris, Charles G..........FRF
Milyard, Raymond C..........FRF
Mesnier, Edward S..........FRF
Mayer, Arthur C..........FRF
Martin, Milton Rex..........SLR; KST
Manley, Henry Sackett..........SLR; CRI
Miller, Robert Lee..........SLR
Moffett, Ralph Charles..........SLR
Miller, Dewel H..........Note 5

N

Noble, Arthur W..........FRF
Nash, Roland L..........BST; FRF
Norwood, George M..........FLT; FRF; SMM
Norton, Howard B..........LHV
Nunenmacher, Francis W..........PFO
Newsom, Albert S..........SLR; FRF; DIK
Noyes, Charles Morgan..........SLR; KST
Nordby, Julius Edward..........SLR
Nelson, William T..........Note 8

O

Orr, Harold E..........FRF
O'Brien, Clarence R..........VBW
O'Connor, Nicholas E..........DAP
O'Briant, Conrad L..........FRF
O'Brien, Frank McAllister..........SLR; PMT
Oakley, Edward H..........CAF
Orr, Dale..........SLR
Owen, Ross G..........FRF

P

Puhl, 'Gene P..........FRF
Pardy, George W..........FRF
Pratt, Harold C..........VBW
Pearson, Wallace D..........FRF
Patten, Ryder..........DIS
Palmerlee, Joseph B..........FLT; FRF; SMM
Page, Henry L..........FRF
Poole, Harold Walter..........SLR; CGC
Parker, Robert M..........FRF
Price, Henry W..........BST
Petrilli, John M..........EOT
Poulin, John A..........FRF
Potter, Justin S..........FRF
Palmer, James Edwin..........RSD; SLR
Perkins, Edward B..........CFT
Peteler, Roland O..........VBW
Pollard, Thomas G..........FRF
Pittman, Wayne V..........PMT
Pedler, Harry W..........FRF
Patton, Edwin J..........EOT
Phillips, Charles A..........FRF
Pearson, Lawrence H..........FRF
Porter, Victor W..........FRF
Phillips, Lyman L..........FRF
Peterson, Herbert Ferdinand..........SLR; CRI
Pierson, Stanley Henry..........SLR; CRI
Penfield, Charles C..........FRF
Payne, Walter Tower..........SLR; ELA
Pennefather, James Sheridan..........FLR
Paynter, Henry Martyn, Jr..........SLR
Prosser, Frank H., Jr..........Note 8

Q

Quinnell, George C..........FRF
Quinneen, Charles Foger..........SLR; PFO

R

Rue, Lars..........SLR; KST
Robertson, James B..........FRF
Rossell, John E..........ELA
Roos, Caril Nathan..........SLR
Rhine, Mel..........SLR; FRF
Richardson, Herbert L..........EOT
Heimerth, Charles H..........CGC
Rogers, Henry Shelton..........SLR; RWT
Ruggles, Daniel G..........KST
Richards, Harrison H. C..........FRF
Rock, Paul C..........CGC
Ream, William R..........FRF
Ray, Luke C..........EOT
Russell, Franklin B..........WFO
Ripperger, Clarence W..........FRF; DIK; SLR
Rome, Robert C., Jr..........SLR; FRF; PMT
Rose, Gamaliel S....PFO; CWT; EOT; Note 1
Rees, Lucius Gibson..........SLR; KST
Robertson, George Albert S., Jr..........FLR
Randell, High P..........FRF
Reynolds, Leo F..........FRF
Raible, Joseph C., Jr..........FLR
Ringer, Albert Russell..........SLR; ELA
Roe, James A., Jr..........FRF
Reeves, Robert Hodd, Jr..........SLR; CRI
Rideout, George R..........FRF
Riecks, Frank C..........FRF
Royal, James M..........Note 12

S

Snarenberger, Burnis A..........PFO
Snow, William J..........EOT
Swaller, Sidney R..........BST
Sandusky, Henry C..........EOT
Stone, Thomas W..........CGC
Stine, Harold B..........PFO
Sine, Myron A..........CGC
Sterck, Thomas..........BST
Sands, Frank T..........LHV
Shankle, Warren C..........KST
Starkweather, Ralph..........SLR; FRF; LDT
Snyder, Kenneth M..........VBW
Szymanski, Sigmund..........BST
Schenck, John Terhune..........SLR; ELA
Shillington, Waldo E..........FRF
Sherry, Cameron B..........FRF
Steinhauer, Louis E..........LHV
Sims, Earl E..........VBW
Schellenberg, Bert G..........PFO
Schermerhorn, Samuel S. V..........DMA
Schuler, George Frederick..........SLR; KST
Shortley, Michael J..........UTA
Shepherd, Robert A..........FRF
Selden, James K..........FRF
Seaver, Lloyd B..........SLR; FRF
Shepherd, Herbert R..........FRF
Schonberg, Eugene..........SLR; VBW
Stetson, Philip C..........FRF
Schmidt, Edgar A..........BST
Smith, Leonard L..........EOT
Summerfield, Vernon Douglas..........SLR; KST
Smith, Ralph Walter..........SLR
Sloan, Harry..........SLR
Sporlein, Louis Wolfgang..........SLR
Stewart, James David..........SLR
Slater, Joseph Marsden..........SLR
Stout, Minor Woolfolk..........SLR
Stodder, John David..........SLR
Stone, Frank H..........VBW
Saltsman, Irl L..........FLR; SLR; SMM
Stearns, Earle D..........EOT
Spainhour, Carl M..........SLR; FRF
Sullivan, Dennis J. M..........SLR; FRF; DIK
Silvermann, Michael M..........SLR; DIK
Stedman, Livington B., Jr..........FRF
Simpson, Walter H..........VBW
Stegall, J. Rex..........FRF
Stuart, George Dayton..........SLR
Sears, Richard Willard..........FLT
Sutter, Julius F..........SLR; AAD
Shawhan, Romer..........FLR
Smith, Albert D..........FRF
Sinclair, William C..........FRF
Shreve, Arthur Lee..........SLR; KST

T

Thigpen, Arthur J..........FRF
Thomas, Herbert L..........BST
Tate, LeRoy H..........EOT
Tomlinson, Kenneth C..........LHV
Taylor, Lloyd J..........BST
Templeton, John Wesley..........SLR; KST; FRF
Thayer, Raymond H..........FRF
Todd, Kirk W..........GLC
Tinnerholm, Ivar E..........FRF
Thierback, George Charles..........SLR
Thornburg, David W..........SLR; AAD
Turner, Wiley B..........FRF
Thompson, Walter H..........FRF
Tilden, George A..........DIS
Taylor, John Albert..........SLR; RWT
Talbot, Elmer Ralph..........SLR; RWT
Tower, Robert Russell..........SLR; KST

V

VanKirk, Russell M..........BST
Valle, Paul..........FRF
Van Inwegen, H. Barentsen..........CGC

W

Walker, Charles C..........CGC
Walton, John M..........FRF
Williams, Paul K..........FRF
Warren, Edward W..........FRF
Wylie, John..........LHV
Wagner, Ned F..........VBW
Wissler, Frank E..........VBW
Wagner, Emil T..........FLT; FRF
Wall, Edward B..........FRF
Waters, Leland L..........EOT
Watkins, Kenneth..........DMA
Ward, Peter C..........DAF
Winants, Garret E..........FRF
Wylie, Laurance..........GLC
Wilkinson, William H..........FOB
Warde, Arthur Frederique..........SLR; RSD
White, Morris G..........FRF
Wells, Everett D..........FRF
Whittell, Alfred..........RTR
Wilkeson, Livingston E..........BST
Waltmate, Louie Frederick, Jr..........SLR; KST
Williams, J..........FRF
White, George M..........CGC
Washburn, Edgar B..........VBW
Wing, Charles R..........BST
Wolf, John E..........PFO
Watson, Osborne S..........FLT; DIK
Wallis, Edmund C..........SLR; DIK; FRF
Williams, Raymond B..........FLT; SMM
Winants, Garrett E..........FLT; SMM
Whitehill, Millard F..........SLR; FRF; TFT
Wells, Harold Raymond..........FRF
Wells, Roe E..........FRF
Worrell, Willard P..........FRF
Walthal, LeRoy Allen..........SLR; LDT; FRF
Watson, Hugh..........FRF
Westenhaver, Robert A..........SLR; CGC
Weisiger, Earl H..........FRF
Winter, Henry Clarence..........SLR
Wilbur, Jesse B..........Note 6
Wood, Ivan D..........Note 6
Wood, Seth F. A..........Note 11
Watkins, Kenneth..........Note 2

Y

Young, Bentley..........FLT; FRF; SMM
Yocum, Reuben J..........LHV
Yates, Reginald L..........KST
Youngs, Grover A..........SLR; KST
Young, Ernest H..........FRF
York, Duke Alexander..........SLR; RWT

Z

Zander, William E..........FRF
Zane, Robert Theodore..........SLR; KST

British aeroplane being loaded with bombs previous to a raid into the enemy's country. Bombs are seen here being placed under the machine

The accompanying photograph shows the trapshooting grounds of the U. S. Army School of Military Aeronautics at the University of Illinois, Urbana, Ill. Some of the aviator cadets are learning to shoot clay targets under the instructions of Mr. W. D. Stannard and Mr. Harry Gill.

Traps have been installed at all aviator camps. The government thus officially recognizes the value of a knowledge of trapshooting to the men who are training for this branch of the service. An important part of their work will be shooting at a moving object, and there is nothing that will develop their skill in this direction so much as practice in trapshooting.

It is quite probable that trapshooting facilities will be provided for all the army camps and cantonments. Not only does it train the soldiers to shoot, but it also furnishes them with healthful, outdoor recreation.

Major Mitchel Falls from Plane

It was officially announced on Saturday, July 6, by Major Kirby, in command of Gerstner Field, near Lake Charles, La., that Major John Purroy Mitchel, former Mayor of New York City, an officer in the Aviation Section of the Army Signal Corps, was killed by a fall from a single-seater scout plane at 7.30 A. M. It was reported officially that investigation had revealed that Major Mitchel's safety belt was unfastened at the time of the accident.

Because of the political prominence of the aviator prior to the entering of the service the accident attracted much attention and the press throughout the country was filled with accounts of the accident, and letters of condolence were sent to Mrs. Mitchel from many of the most prominent personages in the United States.

Major Mitchel went into the army service with previous military training, having taken the course at Plattsburg while he was Mayor. Upon joining the aviation service he was transferred to San Diego, Cal., where, after successfully covering the cadet training, he became a full-fledged flyer. He was frequently mentioned as having shown unusual daring.

With Mrs. Mitchel he arrived on June 19 at Gerstner Field from San Diego. Shortly afterward he began training for the pursuit of enemy machines, using a scout plane. He was reaching the finishing stages of training necessary for service at the war front.

The aviation branch of the United States army took charge of the body and escorted it to the City Hall. There it was received by the Mayor.

After lying in state it was escorted by the military authorities to St. Patrick's Cathedral, where requiem high mass was celebrated by the Rev. Terrence J. Shealy, S.J., assisted by Canon Cabanel, chaplin to the Chasseurs d'Alpines, and the Rev. G. Septier, rector of the Church of Notre Dame, of this city. Interment was at Woodlawn Cemetery.

A list of the honorary pallbearers included Theodore Roosevelt, Cleveland H. Dodge, Nicholas Murray Butler, George W. Wickersham, Jacob H. Schiff and Frank L. Polk.

Bluethenthal Is Cited After Death

Paris.—A posthumous citation of Arthur Bluethenthal, a member of the Lafayette Escadrille, who was killed on June 7, appeared in the official journal on July 7th. It read:

"Arthur Bluethenthal, an American pilot of first rank, volunteered for the Foreign Legion in order to serve in the aviation service of France. He made himself remarked from the beginning by his spirit, discipline and judicious courage. He continued by his own wish to serve with the French Escadrille during the present battle before passing into the American aviation service. He was killed in an aerial combat while directing distant artillery fire."

Pilot Baylies Dead

Word has been received touching on the fate of Frank L. Baylies of New Bedford, Mass. On June 17th, he was brought down inside the German lines while on a flight with his squadron. His comrades and the observation balloon observers all agreed that he had appeared to land his plane safely. One morning shortly after the occurrance a German aeroplane appeared over his late aerodrome and dropped a message saying "Baylies killed. Buried with military honors." Sergt. Baylies was a member of the famous 'Stork Escadrille, of which Guynemer was a member. He had won at the time of his death eight citations under French Army orders, and was recommended for the Legion of Honor.

The Liberty motored Curtiss biplane used for mail carrying. The mechanics are shown in the act of swinging the propeller

Aviator Gino Gianfelice Killed

On Sunday, July 7, Flight Sergeant Gino Gianfelice, one of the best pilots in the Italian aviation service and instructor of Captain Resnati, d'Annunzio, Testoni, and other famous Italian aviators, was killed in an exhibition flight at the army aviation field at Mineola, L. I., before a party of visitors, including Giuseppe Bevione, chief of the Italian War Mission; Howard E. Coffin, Major Gen. William L. Kenly, member of the Aircraft Board and Director of Military Aeronautics; Brig. Gen. Cormark of the British Mission, and many other high officers of the allied armies.

An official report of the accident was given out by Giuseppe Bevione, the head of the Italian Air Mission. The report said:

"Pilot Gianfelice left the ground for the third trial flight of the first American-built Caproni, fitted with three Liberty engines. He carried as passengers General Kenly, Captain Hugo d'Annunzio and Lieutenant Testoni of the Royal Italian Flying Corps. All the witnesses were thrilled with enthusiasm for the easiness, the surety and the agility of the flight, and for the speed of the machine and its ability in climbing, that makes this type an extraordinary successful type, famous the world around.

Went Up in Scouting Plane

"After Pilot Gianfelice had been warmly congratulated by General Kenly and all the other officials who had witnessed the wonderful exhibition, which lasted nearly an hour, he decided to show the virtues of an Italian scouting plane, the S. V. A. single seater fitted with the Spa engine, 205 horsepower. Such a machine is deservedly known all over Europe for its tremendous speed, its manoeuveability, its long raids at the front, among which was the raid to Friedrichshafen from the Italian front and the bombardment of Innsbruck in the daytime.

"Pilot Gianfelice for half an hour amazed the witnesses with the daring exploits he was performing in the air, such as numberless loops, exhibitions of high and exceptionally low speed, demonstrated all a few yards from the ground. Unluckily, after that he started in a nose dive from less than 300 feet from the ground, probably through a mistake in the judgment of the height from the ground. Pilot Gianfelice was driven to about twenty yards from the ground before he was aware of the danger and tried to assume the normal flying position, but it was too late. The machine came crashing to the earth, killing instantly the marvelous and unlucky pilot, who served his country up to his last breath, up to his last sacrifice, lavishly giving his wonderful talents and his own life."

Capt. David McK. Peterson

Capt. David Peterson, of Honesdale, Pa., went to France in 1916 after having received his aviator's license at the Curtiss aeroplane plant. He joined the Foreign Legion and soon was a Chassé pilot. He became a corporal in short order and a sergeant pilot soon after. Then he was elected to the honor society of aviation in France. When the famous Lafayette Escadrille was formed Capt. Peterson joined that, and continued to bring down Boche aeroplanes. He was made a Captain shortly after. He had received the Croix de Guerre with a palm, the highest citation of that medal. One day he brought down three German machines and a few days after he was to be decorated for it. While he was waiting for the French general, he went up in his machine. He saw two Boche machines to which he gave chase and brought them both down. When the Escadrille passed out of existence, he joined the American flying forces in France. He really is the premier American *"Ace"* for he was the first man to bring down five German planes under the American flag. Lieut. Douglas Campbell was reported to be the first Ace, but that was the first American trained Ace. Peterson was the first American to bring down five German machines while flying under the American flag in the Lafayette Escadrille.

Capt Peterson, it is expected, will complete the life story of the late Major Raoul Lufbery, which he had not completed at the time of his death.

General Pershing's aviation report of June 29th, says: "Lieut. Raymond shot down a German aeroplane on the morning of June 24th. Two other hostile planes were shot down on the 25th, by Major Hartney and Lieut. McArthur."

Lieut. Putnam, of Brookline, Mass., brought down his ninth hostile aeroplane north of Toul, on the night of June 30th.

Since the middle of April the American fliers on the French front have brought down twenty-seven German planes. In that time they have lost less than half that number.

A dispatch from Gen. Pershing dater July 3rd, says: "American aviation squadrons co-operated with our troops in the action north of Chateau Thierry. Three of our aviators did not return."

In the course of the day there has been much aerial activity and the encounters reveal the fact that there are now gathering in the Marne region a really formidable number of American flying men. Two German machines were destroyed.

A dispatch from Gen. Pershing dated July 3rd, says: "In the aerial fighting today four more enemy machines were brought down. Victories are claimed for Lieutenants J. H. Stephens of New York, K. L. Porter of Dowagiac, Mich.; Ralph O'Neill of Denver, and Maxwell Perry of Indianapolis.

Defending Paris

Tommy Lennon, formerly the fastest quarter-miler on Lawson Robertson's University of Pennsylvania team, is one of fifteen American aviators who are aiding the French fliers in the defense of Paris against air raids.

Two American Fliers Awarded War Medals

Paris—Sergeant Frank L. Baylies, of New Bedford, Mass., and First Lieutenant David E. Putnam, of Brookline, Mass., American aviators have been awarded a war medal by the Foreign Service Committee of the Aero Club of America, "for valor and distinguished service."

Edwin Parsons, of Springfield, Mass., a member of the Lafayette Escadrille, is mentioned in official citations as "an excellent pilot who has downed three enemy aeroplanes.

Investigators Go to Dayton

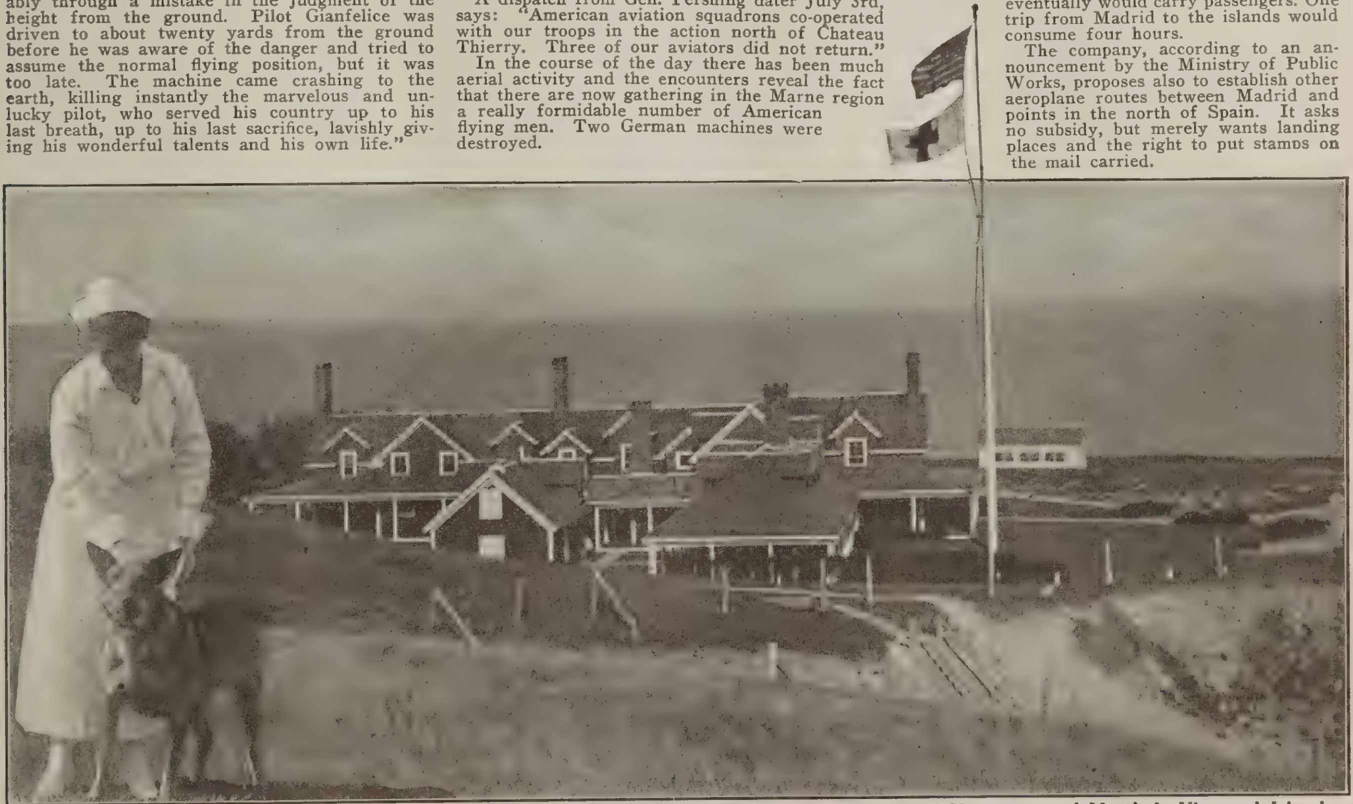
Dayton, Ohio, July 9.—Attorney General Thomas W. Gregory arrived here today to lend legal aid in the conduct of an investigation of matters pertaining to the aircraft program. His arrival was within twenty-four hours of that of Charles E. Hughes, who is investigating aircraft production by direction of the President.

Both men refused to say what the nature of the investigation is to be. Mr. Gregory said men from other cities might be summoned. The investigation continued today at the Federal Building behind closed doors.

Plan Air Mail for Spain

Madrid, July 9.—Establishment of an aeroplane service between Madrid, Barcelona, and the Balearic Islands is proposed by a newly formed company which has made application for official authorization to the Ministry of Public Works. The company would first start a mail service and eventually would carry passengers. One trip from Madrid to the islands would consume four hours.

The company, according to an announcement by the Ministry of Public Works, proposes also to establish other aeroplane routes between Madrid and points in the north of Spain. It asks no subsidy, but merely wants landing places and the right to put stamps on the mail carried.



Main building of the Red Cross Convalescent Hospital at Cuttyhunk, Mass., looking over Vineyard Haven toward Martha's Vineyard Island. The nurse shown in the foreground is the Head Nurse, Miss M. Churchill. The dog is Cleopatra, a Red Cross or Police Dog.

The Red Cross Convalescent Hospital at Cuttyhunk, Mass. A beautiful, comfortable convalescent home for aviators

The accompanying photograph shows the new Red Cross Convalescent Hospital situated at Cuttyhunk, Mass., which has just been recently established for the use of injured aviators. While it is well equipped as a hospital, its real mission is to assist the aviators back to health and strength. Dr. Norman E. Ditman, the medical director, and his staff are anxious to help the aviators. The Home is equipped with billard rooms, tennis court, and other conveniences.

How to Get to Cuttyhunk

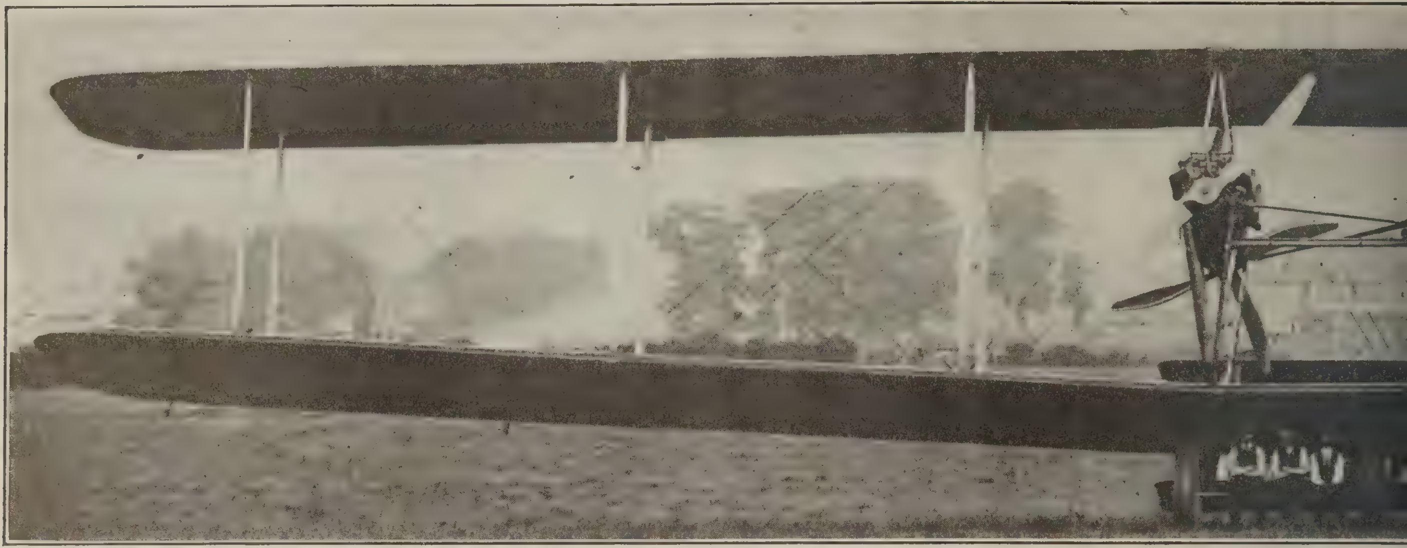
Cuttyhunk is reached by boat sailing 9:30 A.M. daily from Merrill's wharf (foot of Walnut St.), New Bedford, Mass.

Connecting train leaves Boston 6:40 A.M., arriving at New Bedford 8:35 A.M.

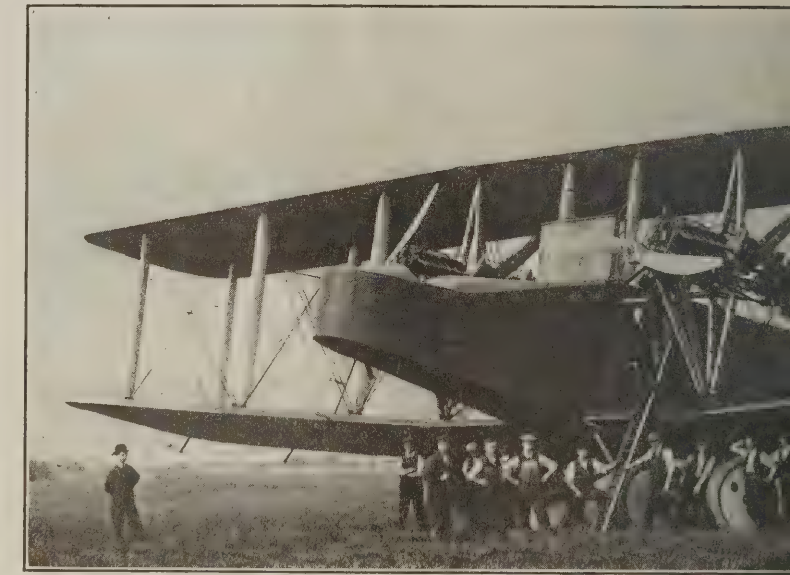
From New York, Fall River boat leaves Pier 14, North River (foot of Fulton St.), daily at 5 P.M., arriving in Fall River 5:30 A.M. Trolley from Fall River to New Bedford—one hour run—leaving Fall River at frequent intervals.

From New Bedford—*after June 21st*—New Bedford line steamers leave Pier 40, North River, foot of Houston St., daily at 6 P.M., arriving at New Bedford 6:30 A.M., at wharf foot of Union St.—two blocks from Cuttyhunk boat wharf.

Train connections from New York to New Bedford via Providence and Taunton or Fall River.



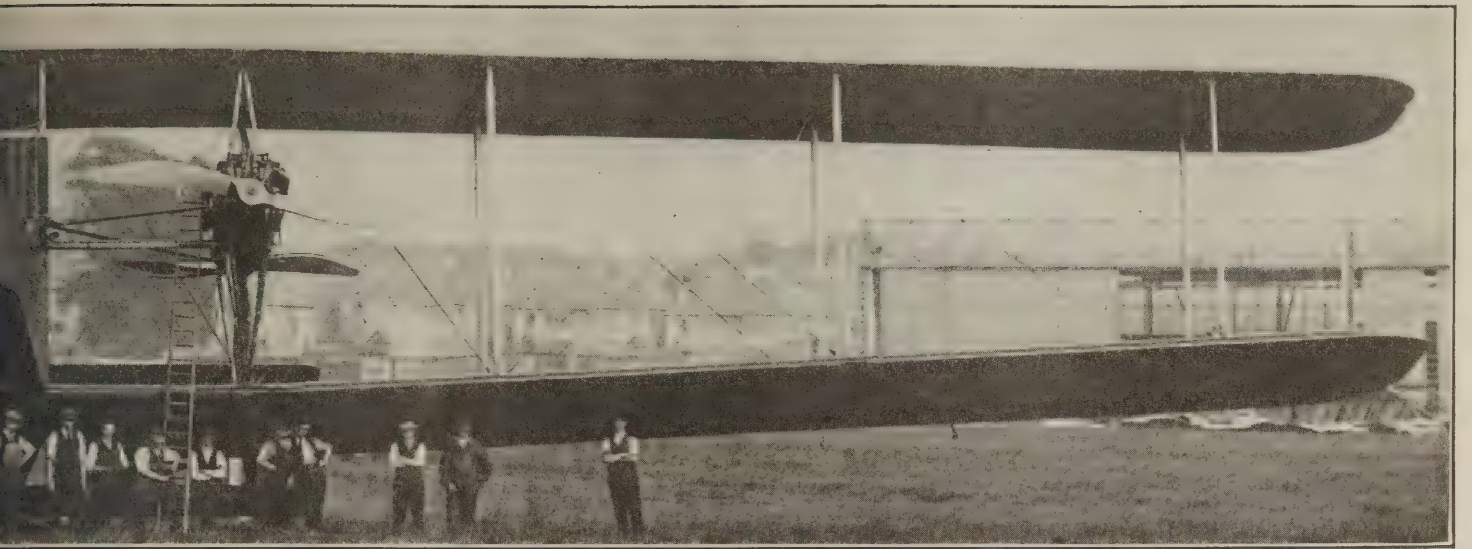
Photographs of the latest type of Handley-Page Air Cruiser equipped with four motors. This machine, the photographs of which are reproduced herewith, by courtesy of the New York Herald and the New York Times and Mr. W. H. Workman, representative of Handley-Page, can carry more fuel and useful load than is needed to fly across the Atlantic by way of the Azores

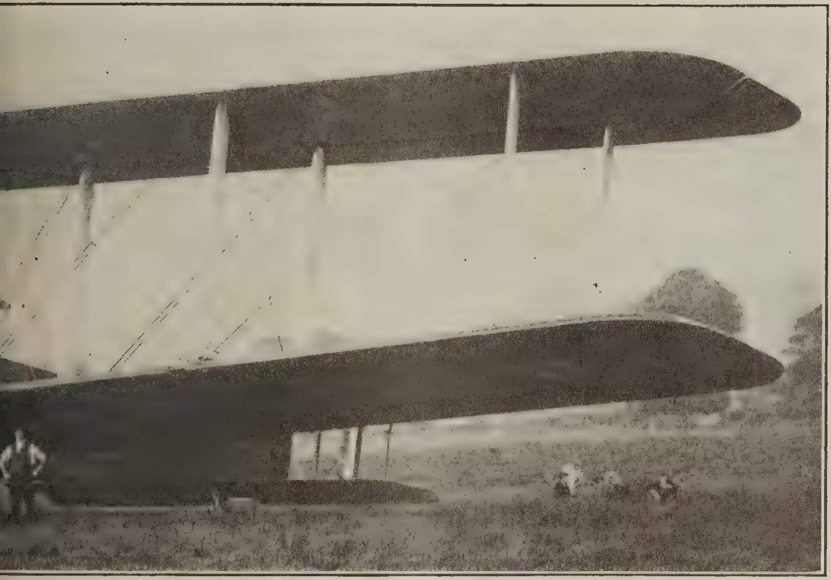


Three-quarter view of the latest Handley-Page Air Cruiser. The immensity of this
almost as ta

Major-General William L. Kenly, Director of Military Aeronautics, who made the first flight in the first Handley-Page Air Cruiser built in the United States. General Kenly has probably flown more miles than any other officer of his rank, having always used the aeroplane to go from place to place when he was in France and upon his return to the United States

Officers of the Standard Aero Corporation, which has





an be noted in many ways. It will be noticed that the wheels are about five feet high, en standing by it

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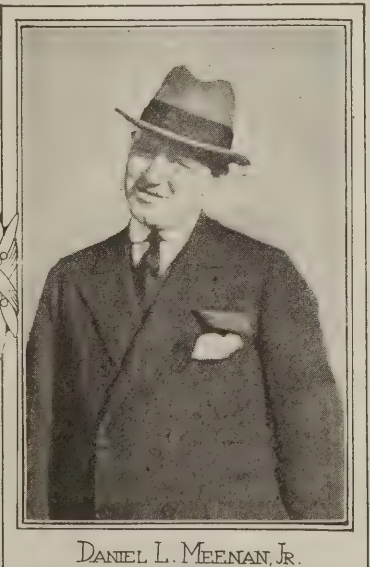


DANIEL L. MEENAN, JR.
TREASURER.

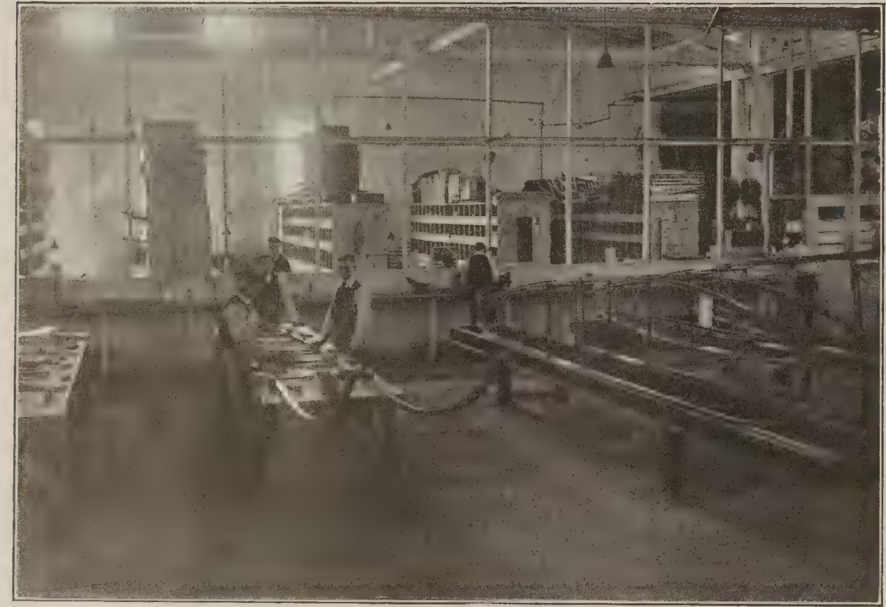
first Caproni and Handley-Page air cruisers built in America

In an article describing Joseph Handley-Page, inventor of the aerial dreadnought which bears his name, W. H. Workman, one of Mr. Handley-Page's associates, said that to those who have heard of his firm as producing war machines only it might appear that Mr. Handley-Page's name has become known through the war alone. As a matter of fact, said Mr. Workman, Mr. Handley-Page's career in aeronautics extends over ten years. Mr. Handley-Page is 33 years old

Two views of the Springfield Aircraft Factory—one of the latest acquisitions to the American aeronautic industry, who are beginning to contribute substantially to the aeronautical equipment of the American Air Forces

Aviator Finishes 2,500-Mile Flight

Kelly Field, San Antonio, Tex.—Lieut. Frank M. Bartlett arrived here on July 3rd, completing a 2,500 mile flight from Scott Field, Belleville, Ill. He made the 341 miles between Scott Field and Park Field at Memphis, Tenn., in the record time of three hours and five minutes. He said his most thrilling experience was in a violent storm.



Italian Envoy Sees Victory Won in Air in Eight Months

Captain Giuseppe Bevione, Italian Commissioner of Aviation in the United States, has arrived in New York. His purpose is to obtain help from the United States for the development of Italian military aeronautics.

Captain Bevione is in the Alpini Corps. He is one of the youngest members of the Italian Parliament, representing a district in Turin.

Captain Bevione made the following statement as to his mission here:

"Through its raw materials, its industrial organization and its skilled men, the Entente can build and arm an aerial fleet at least ten times larger than that which the Central Powers can bring into being. If this result can be effectively achieved in 1919, if in eight months from now the allied nations have an aerial fleet in Europe with many thousand more machines than that of the enemy, and if this fleet will be used with intelligence and inexorable energy, then the war will be won, because the resistance of the enemy will be conquered and stricken at its very roots in their vital centres.

"To increase courageously our production for the time being to the extreme limits of our power means to ask America for an ever-growing quantity of raw material—metals, wood, chemicals, gasoline, textile fibre.

Movies of Air Mail Route

Moving pictures were made from the air on July 3rd, of the route of the aerial mail men between New York and Philadelphia. Similar pictures will be made of the line from Philadelphia to Washington. The camera man was Lieut. T. H. Webb, who also flew over the line of the parade in Manhattan and trained a moving picture camera on the scene below.

Lieut. Miller took the regular mail to Philadelphia and Lieut. Webb piloted the mail machine back, reaching Belmont at 3:15 o'clock in the afternoon.

American Flier Wounded

Brooklyn.—Word has been received that Oscar Lange, of the 104th Aero Squadron, has been wounded in France. No details were given.

Lieut. Schuyler Lee Dead

Flight Lieut. Schuyler Lee of the French aviation service, formerly in the Lafayette Escadrille, who was reported missing after an air encounter over the western front on April 12, was shot down and found dead east of Montdidier. Notification was received on July 6th by the officer's father.

Earl Hall, the Y. M. C. A. of Columbia University. The men seen here are being trained for war photography or for having charge of wireless used in aviation

AIR PROPULSION

By MORGAN BROOKS, Urbana, Ill.

THE term airscrew, considered by many writers on aeronautics as descriptive of propeller action, is a misnomer. The theory of the marine propeller, which seems to be adequately presented by the screw principle, has been transferred to air propulsion without sufficient regard for the extreme difference in the two fluids as to elasticity. Imagine automobile tires filled with water. In view of the current theory that air is driven by a propeller with a velocity never exceeding the product of the propeller's pitch and its revolutions, it was a surprise to find that air may be driven backward at a velocity nearly twice as great as this product indicates. The fact was so revolutionary as to cause the greatest care in measurement before its acceptance. Recognition of this superspeed action of propellers explains many anomalies of air propulsion and will undoubtedly lead to more exact formulæ for thrust and power calculations.

2. The purpose of this paper is to give proofs of the facts stated, and to point out some of the applications of the superspeed theory as it relates to propellers and blowers.

3. Superspeed is not observed readily in connection with the standard type of two-bladed propeller, owing to the masking of the effect by the mingling of high-speed air with a much larger quantity of inert air lying between the propeller blades. The measurements were made upon a special type of propeller having extremely short blades of great width, sweeping the entire 360 degrees of the disk area, in fact. It should perhaps be stated that with the acceptance of superspeed the definition of slip as "the backward velocity of the current from a propeller" must be abandoned; but another definition of slip, "the shortage of velocity translation as percentage of propeller screw advance," may survive owing to its convenience.

4. A propeller of the wide-blade type described having an experimental mean pitch of 2.53 ft., gives a wind on static test that flows 3.33 ft. per revolution, regardless of the rotation speed of the propeller. These values were determined for the writer by Prof. E. P. Lesley at the Leland Stanford Junior University wind tunnel, confirming his own measurements. The superspeed ratio, 3.33/2.53, is 1.32, and these figures bear so direct a trigonometrical relation to the blade angle as to suggest that air instead of being swept backward by screw pressure is driven back by precise reflection or batting action.

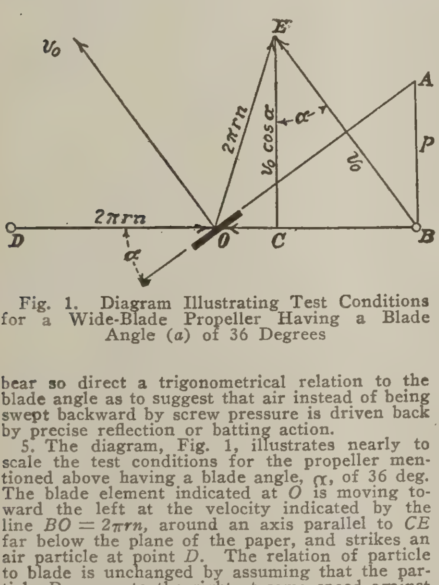


Fig. 1. Diagram Illustrating Test Conditions for a Wide-Blade Propeller Having a Blade Angle (α) of 36 Degrees

5. The diagram, Fig. 1, illustrates nearly to scale the test conditions for the propeller mentioned above having a blade angle, α, of 36 deg. The blade element indicated at O is moving toward the left at the velocity indicated by the line $BO = 2\pi rn$, around an axis parallel to CE far below the plane of the paper, and strikes an air particle at point D. The relation of particle to blade is unchanged by assuming that the particle D moves to the right at same speed against a stationary blade, and is reflected to point E in unit time. Had the blade not been in the way the particle would have reached B, hence the blade has deflected the particle in the direction BE, represented also by the vector Ov_0 with respect to the plane. Ov_0 is perpendicular to the instantaneous position of the blade when striking the particle. Under the reflection theory assumed, the axial velocity of the air particle is the projection of this vector, that is, $CE = v_0 \cos \alpha = 2\pi rn \sin 2\alpha$. To the same scale BA represents pitch multiplied by revolutions, the accepted air velocity by the screw theory. Since $BA = 2\pi rn \tan \alpha$, the ratio of superspeed velocity to screw-pitch velocity is $CE/BA = 2 \sin \alpha \cos \alpha / \tan \alpha = 2 \cos^2 \alpha$. For the 36-deg. angle of the special test propeller this ratio, since $\cos 36° = 0.81$, is 1.31, which agrees with the value 1.32 experimentally determined by pilot-tube measurement with sufficient precision to warrant acceptance of the reflection theory, especially when similar close agreement was found with a blade of 28 deg. angle and by other confirmatory tests.

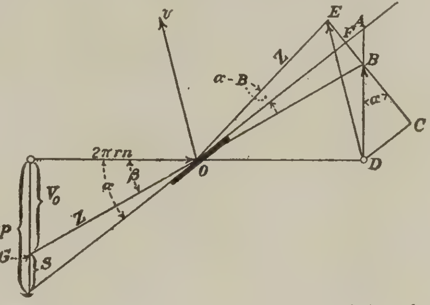


Fig. 2. Diagram Illustrating Test Conditions for a Propeller Operating on a Flying Plane or in a Wind Tunnel

6. To illustrate the more complex condition of a propeller operating on a flying plane or in a wind tunnel with corresponding wind conditions, Fig. 2 is offered. Here, as before, the blade, instead of rotating to the left at the velocity $2\pi rn$, is assumed stationary, and the air particle at G is assumed to move to the right at the velocity $2\pi rn$, combined with the velocity V_0, also reversed, representing the plane's translational velocity, or, in the case of a wind tunnel, that of the impressed wind. In unit time the particle moves along the diagonal path Z, strikes the blade at O, and is reflected to E. The angle of incidence and of reflection is $\alpha - \beta$. But for the blade the particle would have reached B in the same time, so that the blade action is represented by BE, while under the screw theory the motion would be BA, the slip, which is more clearly indicated as S at the left of the diagram. The axial projection of BE is $BE \cos \alpha$, not represented in the diagram, and the ratio $BE \cos \alpha / BA = 2 \cos^2 \alpha$, the same ratio as found for static test conditions. This relation is derived as follows:

$$BE = 2\ FE = 2\ Z \sin (\alpha - \beta) = 2\ Z\ (\sin \alpha \cos \beta - \cos \alpha \sin \beta)$$

but

$$Z \cos \beta = 2\pi rn = np \cos \alpha / \sin \alpha$$

and

$$Z \sin \alpha = V_0$$

hence

$$BE = 2 \cos \alpha\ (np - V_0)$$

and

$$BE \cos \alpha = 2 \cos^2 \alpha\ (np - V_0)$$

7. Thus either for static or flying tests an air propeller produces a velocity or a change in velocity which has a superspeed ratio of $2 \cos^2 \alpha$ as compared with the screw-advance theory. This factor varies from nearly 2 for low pitch angles found near the blade tip to 1 for a 45-deg. angle, the steepest blade angle for effective work in propellers. For a propeller of constant pitch equal to diameter, a normal design, the superspeed ratio is 1.8 for the blade tip and 1.4 at half radius. Since the activity of propellers is confined mostly to the outer half of the blades, normal values for superspeed would lie usually between 1.5 and 1.6.

8. In wind-tunnel tests, where alone velocities of the air can be measured satisfactorily, the propeller activity BE is combined vectorially with the wind velocity V_0, making the vector DE, represented also by O^v, the velocity to be measured. The difference between this and $DA = np$ is not very marked except at rather heavy slip conditions. For low blade angles, however, where the superspeed ratio is more pronounced, careful speed measurements show that the air leaves the propeller at higher velocities near the blade tips than part way in, a condition inconsistent with the screw theory for standard-type constant-pitch propellers. Eiffel's "Recherches" presents an elaborate collection of data showing this condition to exist, for which no explanation is offered, but the reflection theory explains it.

9. When the direction of the air flow from a static propeller is investigated by means of light ribbons, they show that the air moves in a direction strictly perpendicular to the blade angle, the condition demanded by the reflection theory but not by screw action. More over these ribbons indicate that the stream contracts in diameter slightly as it leaves the propeller with its rotating whirl, whereas with the squeezing action of a screw it would be expected that the air would be expanding rather than contracting. Fig. 3 is an isometric drawing to show this rotating, contracting whirl.

10. The most convincing demonstration of the velocity of air leaving a propeller faster than the propeller screw advances is found in a test made with two propellers connected in tandem, illustrating a wind-tunnel test. Calling the forward propeller a blower, for distinction, assume that it provides a wind at 30 miles per hour, or 44 ft. per sec., and that the propeller is driven in this wind at a speed just above idling speed, such that its revolutions times pitch is, say, 48 ft. per sec. An aneomometer shows a velocity of about 50 ft. per sec. If now the blower be shut down, while the speed of the propeller is maintained constant, the wind velocity rises to 75 ft. per sec. instead of remaining constant as demanded by the screw theory.

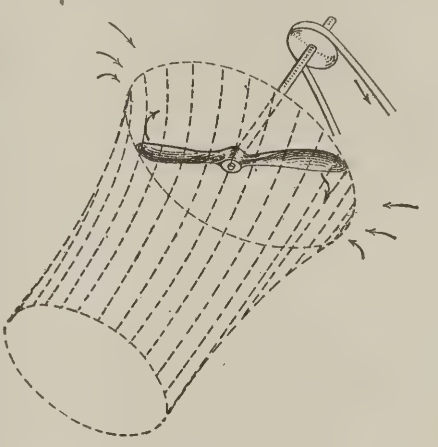


Fig. 3. Sketch Showing Direction of Air Flow from a Static Propeller

11. Accepting superspeed, then, it is seen that since the air is driven backward at an excess rate, the thrust due to this unexpected acceleration is, by the Newtonian laws of dynamics, due in greater degree to speed and less to the quantity of air handled than is commonly supposed. It has long been recognized that the evaluation of dynamic thrust equations requires the questionable assumption of blade activity over a larger portion of the propeller disk than that covered by the blades alone. Indeed, some authorities, such as Riach, use the entire disk area as that actuated by the propeller. Seventy-mile flight at 30 per cent slip is commonly supposed to mean that the air is driven backward at 30 miles per hour, while its actual speed is nearer 50 miles per hour. This means that the column of air with respect to the plane is not 100 miles but about 120 miles per hour in length. No wonder it is difficult to get satisfactory results from air-dynamics formulæ now in use, except from well-developed empirical formulæ.

12. The proper interpretation of superspeed bids fair to reconcile the thrust and power values as derived from the static tests with those of wind tunnels or of flight, whereas it seems to be the common opinion today that flying performance cannot be predicted from static tests. With the precise air-dynamics formulæ sure to come, a single static test of a propeller should furnish all necessary data for the production of complete flying-performance curves.

13. As a preliminary empirical approximation, the following formula may prove useful: $T = T_0 - T_0'$, where T is flying thrust, T_0 the static thrust at propeller speed n, and T_0' the static thrust at propeller speed V/p, where V is plane velocity and p propeller pitch. That is, T_0' is taken statistically at what is idling speed in the wind. Since all static-thrust values are proportional to the square of the rotations, a single static thrust at any speed enables both T_0 and T_0' to be derived. The physical meaning of this seems to be that the wind-tunnel blower relieves the propeller of that portion of T_0 represented by idling speed, even though the propeller, giving super-speed, sends air backward when tested statistically at speed V/p, faster than the velocity V. Under this formula the flying thrust at 30 per cent slip is found to be 51 per cent of the static thrust at speed n.

14. Correct air-dynamics formulæ will not produce the changes in propeller design that might by anticipated, since propeller engineering is nearly always based on experience. The propeller, or air bat, is extraordinarily efficient today. However, it is hoped that this paper may lead to a clearer conception of the underlying physical principles of air propulsion.

Presented at the Spring Meeting, Worcester, Mass., June, 1918, of The American Society of Mechanical Engineers.

FOREIGN NEWS

FRANCE

Paris, June 28th.—A report on the operations of French aviators, issued June 28th says:

"On June 26th-27th twenty German machines were brought down or put out of action, and four captive balloons were burned. Our bombarding squadrons in the same period during the day and night dropped fifty-eight tons of projectiles on aviation grounds along the Somme and Aisne and on cantonments and bivouacs at Rozieres-en-Santerre, Fismes, and Guignicourt, and the stations of Soissons, Fère-en-Tardenois, and other places. Two munition depots were exploded and several fires were observed."

On June 29th, our chasing planes brought down fifteen German machines and destroyed two captive balloons. Nineteen other enemy aeroplanes were damaged.

Our bombing planes in the course of the same period carried out day and night expeditions in which forty-seven tons of projectiles were dropped with success upon aviation grounds in the Somme sector, on bivouacs in the region of Rozieres and Braye, in the valley of the Avre and on the railroad stations of Soissons, Fere and Tardenois.

In addition five tons of explosives were dropped June 28 on German troops which were preparing a counter attack in the region of Cutry.

Lieut. Fonch brought down three German aeroplanes on June 25th and two others on June 27th, bringing the number of machines destroyed by this pilot up to forty-nine.

On June 30th, twenty-one German aeroplanes were brought down or put out of action, and six captive balloons were set on fire. The following night our bombing machines dropped twenty-two tons of projectiles on aviation grounds in Picardy, the Roye railway station and munitions depots at Villers-Carbonnel, where a violent explosion occurred.

The French War Office statement for June 7th contains the following:

From July 1st to 6th our aviators brought down or put out of action eighteen enemy planes and set on fire seven captive balloons. In the same period our bombing machines dropped fifty-six tons of projectiles on stations, cantonments, establishments and aviation grounds in the enemy zone. A fire was started in the aviation post at Chaulnes and at Amagne-Lucquy, and violent explosions followed by fires occurred in munitions depots at Neuville and Roye.

GREAT BRITAIN

The British report of June 27th, says:

"On the night of June 26-27, sixteen tons of bombs were dropped on various targets. Our aeroplanes attacked the chemical works at Ludweighshafen, the factories and railway sidings at Saarbrucken and the airdrome at Bolchen. Several bombs fell on an active furnace at Saarbrucken. At Bolchen two hangars were set on fire. All our machines returned safely."

A full day's work was done on June 27th by our reconnaissance, photographic, and artillery machines. There was some increase in hostile activity in the air, and more fighting occurred.

Twenty German aeroplanes were destroyed and nine driven down out of control. Fourteen of ours are missing..

There was much fighting in the air on the British front on the 28th inst., and enemy machines showed considerable activity. During the day we shot down seventeen German aeroplanes and drove down six others out of control. Three of our machines are missing.

Our airmen and balloon crews, employed in observation work, took advantage of the fine weather to co-operate with the artillery in engaging hostile batteries and ammunition dumps with good destructive effect. A great number of explosions and fires were caused by this work. Our photographic machines also were active, and many reconnaissances were carried out both by day and night.

Twenty-two tons of bombs were dropped by us during the day on various targets and fourteen and a half tons in the course of the following night.

Hostile activity was not great on June 29th, but our fighting machines succeeded in destroying nine German aeroplanes and disabling eight others. Five of ours are missing.

Fifteen tons of bombs were dropped, the most important targets being the railway stations at Lille, Courtrai, Comines and Estairs.

At night there was bombing activity on both sides. The enemy did virtually no damage, but lost one machine. We dropped eighteen tons of projectiles, of which eight tons were launched upon railways.

On Saturday night bombing squadrons attacked the railroad works at Thionville, the sidings at Metz, Sablons and enemy aerodromes at Frescati and Boulay, as well as other military objectives. The presence of a mist prevented observations of the results.

On Sunday our aeroplanes dropped many bombs on the Hagenau aerodrome with good results. The barracks and station at Landau were also bombed. An enemy aerial formation over Landau heavily attacked our machines. Three of the enemy's aeroplanes were destroyed and two of ours are missing.

"On June 30th we had a most successful day in the air.

"In fighting, twenty-five enemy machines were shot down and ten others were driven out of control.

"Two German balloons were destroyed.

"Our airmen carried out a number of reconnaissances over the lines on June 30th, both by day and by night and many aerial photographs were taken.

"The number of hostile batteries destructively engaged by our artillery with aeroplane and balloon observations was greater than on any day during the past fortnight.

"Twenty-nine and a half tons of bombs were dropped by us by day and seventeen tons on the following night. Of the latter more than seven tons fell with good effect on the railway connections at Tournai. From the whole of these operations all our aeroplanes returned safely with the exception of one scout and one night bombing machine."

An official statement issued by the Air Ministry, July 1st, reads:

"On the night of June 30th-July 1st, attacks were made on the enemy aerodrome at Boulay and on railway works and stations at Thionville, Remilly, Landau, Zweibrucken and Saarbrucken. The chemical works at Mannheim were again attacked.

"On July 1st the railway and workshops at Karthaus, the station at Treves and the railway triangle of Metz Sablons were bombed with good effect. One hostile machine was shot down and two of ours are missing. One of the machines reported as missing on June 30th has returned."

On July 1st our aeroplanes were very active, the fine weather enabling much work to be done in co-operation with the artillery, as well as reconnaissance and photography.

Twenty-five German machines and three German balloons were destroyed during the day, and fifteen other hostile aeroplanes were driven down out of control. In addition, two large hostile night-flying machines landed behind our lines, the occupants being taken prisoners. Eight of our machines are missing.

Twenty-two tons of bombs were dropped during the day and thirteen tons during the night. All our night-flying machines returned safely.

The independent air force communication on aerial operations says:

During the night of July 1st-2nd, the enemy's aerodrome at Boulay was successfully attacked, bursts being observed on the aerodrome and hutments. The Oppau works, soda factory and railway line at Mannheim were bombed with good effect, as were also the railway works at Thionville.

On July 2nd bombs were dropped on the railway station at Treves. Our formation was attacked over its objective by twelve enemy machines, one of which was shot down.

The railway sidings and sheds at Coblenz were bombed with good results. All our machines returned safely.

The official communication of July 3rd, dealing with aerial operations reads:

"The weather on July 2nd was fine but hazy. Our machines carried out reconnaissance, artillery and photographic work as usual, but there was less enemy activity.

"Thirteen German aeroplanes were destroyed and nine others were driven down out of control. One German balloon was shot down. Four of our machines are missing.

"Nineteen tons of bombs were dropped in the course of the day and night on enemy railways, dumps and billets."

For July 3rd the weather was cloudy and enemy activity was slight. Our machines carried out a number of reconnaissances and co-operated with the artillery as usual. Six enemy machines were destroyed and four were driven down out of control.

During yesterday and last night the British machines dropped sixteen tons of bombs, the railway junctions at Lille and Courtrai being the principal targets. All our machines returned safely.

The British aerial statement on July 5th said:

"On July 3rd the weather was cloudy and enemy activity was slight.

"Our machines carried out a number of reconnaissances and observed as usual for the artillery. Six hostile machines were destroyed and four others driven down out of control.

"During the day and the following night, we dropped sixteen tons of bombs on the railway junctions at Lille and Courtrai. Our machines returned safely."

The official report of July 6th on aerial operations says:

"There was little fighting in the air on July 5. Two German machines were destroyed and one was driven down out of control. One of our machines is missing.

"Our aeroplanes and balloons carried out a large amount of successful artillery work. Nineteen tons of bombs were dropped on selected targets during the day and the following night.

"Eleven German aeroplanes were destroyed and ten driven down out of control as a result of combats. One hostile balloon was shot down in flames. Four British machines are missing."

An official statement issued on July 6th by the British Admiralty says:

"During the period between July 1 and July 3 one enemy seaplane was destroyed and three indecisive combats took place.

"Fifteen and a half tons of bombs were dropped by our airmen. Fires were started at Bruges. At the Varssenaire aerodrome bursts were observed among the sheds, hangars and warehouses, while other bombs exploded on the Maria Aelter aerodrome and at Zeebrugge, near the lock gates and near two submarines. Four hits were registered on an enemy destroyer off the Bassin de Chouage and on sheds, warehouses and quays at Ostend."

The official communication dealing with aerial operations, issued on July 7th, says:

"Our balloons and observation machines carried out much valuable work on the 6th instant. There were few combats in the air. Three German aeroplanes were destroyed and one was driven down out of control. One of our machines is missing.

"Seventeen tons of bombs have been dropped on various targets during the past twenty-four hours."

The Air Ministry's report on aerial operations says:

"Our squadrons successfully attacked railways at Metz Sablonz Saturday afternoon. Two and a half tons of bombs were dropped on our objectives. Our formations were attacked over the objectives by enemy machines, one of which was driven down. All of ours returned.

"During the night our machines successfully attacked the railroad station and sidings at Saarbrucken and the railways at Metz Sablons."

ITALY

The Italian War Office reported on June 29th as follows:

"Railway centers and enemy troops in movement were bombarded by our allied airmen. Three enemy machines were brought down. In the course of the last two days our bombardment flights dropped about 18,000 kilograms of bombs on important centers and ,crossroads of the enemy.

"On the lower Piave troops and transprots were attacked with machine gun fire at a low altitude. One of our airships effectively bombarded a railway junction in the Sugana valley.

GERMANY

The German official of June 28th, says:

"Strong flying forces have been brought into action. They led to violent aerial combats. Yesterday our aviators shot down twenty-five aeroplanes and one captive balloon, and our anti-aircraft guns shot down five aeroplanes."

The German War Office in its official communication of June 30th says:

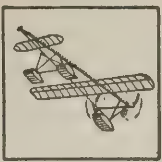
"In the air nineteen enemy aeroplanes were shot down."

The official communication from German headquarters on July 3rd says:

"Four aeroplanes were shot down from an American squadron of nine units."

MODEL NEWS

Edited by John F. McMahon



Junior Aeronautical Reserve Has New Member

Considerable interest is shown lately in the "Junior Aeronautical Reserve" more so I suppose on account of the good model weather we have had lately. Mr. Garber, President of the Capitol Model Aero Club sends me a very interesting outline of the work the club has been doing in preparation for their entry into the Model Aero Game as a step to the larger machines. His letter may be of interest to other model aero clubs who wish to get in line, and I reprint it here for your information.

"The Capitol Model Aeroplane Club," of Washington, D. C., has been in existence four months and a half. We realize the many benefits resultant from co-operating with the "Junior Aeronautical Reserve," and desire to list ourselves under its supervision.

We organized on February 5, 1918, and at the outset consisted of seven members. A constitution was drawn up, and the work of organization was assigned to various committees. Since then we have progressed steadily. We now number twenty-one active members and nine inactive members, which brings the club up to its full strength. We have limited the number of members, because we feel that some members are more active than others, and that by an elimination of the "dead wood," we can move much faster. This may seem a bit unfair to the slower members, but we know that when our club is fully organized, we can then take on many more, and will be strong enough to aid the weak, without danger of drowning ourselves.

The active members, are those who actively engage in the affairs of the club, attending meetings and fulfilling offices. The inactive members are those who by reason of a position or other obstruction, find themselves unable to attend the meetings, but who aid the club by various contributions of knowledge, experience, material, money, etc. We find this to be an excellent arrangement, as we have at hand a number of professional chemists, mechanics, etc., who give invaluable aid to us, although they cannot always be with us.

We have two classes of members: Junior members and senior members. The junior members are those who have not passed the qualifications as senior members, and who have no vote. The senior members become such after they have passed one or more of the tests as set forth in the Handbook of the club. These tests determine the knowledge of the members, and the competition developing from the divisions, spurs the members to learning.

Besides the features already mentioned, there are others which we use, most of which we have originated, which are as follows: The War Game, The Scrap Book, The Committees, The Correspondence Course, The Library, The Supply Division, The Workshop, The Bulletin, and The Lectures.

Briefly, they may be explained as follows: The War Game, is a method of spurring the members to effort, not only for themselves, but for the Club. It consists, essentially, of a board, marked off into two divisions, which are marked with rows of holes. Each member is given a row, and the advancement depends upon himself. You see, the board represents a battlefield, and each member is piloting an aeroplane over no man's land. We have a list of points which a member may gain, by working for the club, through its committees, and at each point, he moves up one hole. When he has advanced far enough to gain the top hole, he is given a spin at a wheel. The wheel revolves until it arrives at the number of one of the competitors on the opposite side, who is either captured or killed. If the "Enemy" is behind the lines, he is captured, but if he is within three points of "No Man's Land," he is killed. If he is killed he is out of the game, but if he is captured, he must gain three points to resume playing. There are many rules, and if any of the clubs desire a list of them, the secretary will gladly comply.

The Scrap Book, is a book, kept by the secretary, which is filled by the newspaper clippings, pictures, etc., collected by the fellows.

The Committees are as follows: The Photography, which is responsible for photographs of everything relating to aviation that goes on in the capitol; the Contest Committee, which arranges for all competitions; and the Patent which reserves to a member the exclusive use, for a limited period, of any feature of the member's own contrivance.

The Correspondence Course, is a method we have on instructing members. We start them on the principles, and continue until they have mastered model aviation as completely as we can fit them.

The Library is a collection of books, magazines, catalogues, etc., which the members collect for the enlightenment of members.

The Supply Division, is for the purpose of finding where materials can be bought cheapest and best, and advising the members accordingly. They are also enabled through this division to pool on an order and save money, postage, etc.

The Workshop, is one shop, toward which all of the members contribute in the manner of tools, materials, etc., to which all fellows, who have no shop of their own, can come and work.

The Bulletin is a paper, issued monthly, which advises members who are inactive, absent, or otherwise unable to attend the meetings, of the doings of the club. This is quite successful and helpful, as it keeps all of the fellows interested.

The officers of the club are as follows: President, Paul Edw. Garber, 1726 M St., N. W.; Vice-President, Geo. O. Riggs, 1824 Belmont, N. W.; Secretary, Charles Irelan, 2511 Cliffbourne; Treasurer, Thomas Smallwood, 908 14th, N. W.

The meetings are held every Tuesday evening at 7:30 at the home of the Secretary.

The club controls about thirty flying models, some of which are exhibited about the city, and gain much publicity and commendation for the club.

Lectures are given by interested patrons upon different subjects at various times. This makes the meetings attractive. Among the lectures I might mention the following as having been especially instructive:

"Bird Flight and Aviation," by Dr. Paul Bartschl, of the Smithsonian Institute.

"Technicalities and Mathematics of Wind Pressure and Air Resistance," by L. W. Heron, head machinist instructor, McKinley Technical School.

"Military Aerial Photography," by the President of the club.

Besides those mentioned, we might mention the following as patrons of the club:

Mr. Kaufman, owner of the *Evening Star*, Washington, D. C.

Mr. George Ireland, of the Patent Office.

Lt. Col. Geo. Riggs, Chief Intelligence Officer, U. S. Expeditionary Force, France.

Alexander Graham Bell, Inventor of the Telephone, etc., and many others.

The qualifications for admittance into the club are as follows:

No age restriction.

Deep interest in aeronautics.

Mechanical ability.

Permission of parents.

Entrance fee, $.25 semi-monthly dues, $.05.

We will be glad to give any further information concerning the club to any desiring same. Any resident of Washington or vicinity wishing to join the club, kindly communicate with the Secretary, and admittance will be considered.

Handley-Page Bombing Aeroplane Model

The model shown in the accompanying illustration is of the very highest model construction, not one thing on the big machine is missing on this model, the shock absorbers, Rolls-Royce Radiators which are characteristic of the Handley-Page machine. The radiators on the model were made of thin soft brass and shaped around a special former, to the proper size.

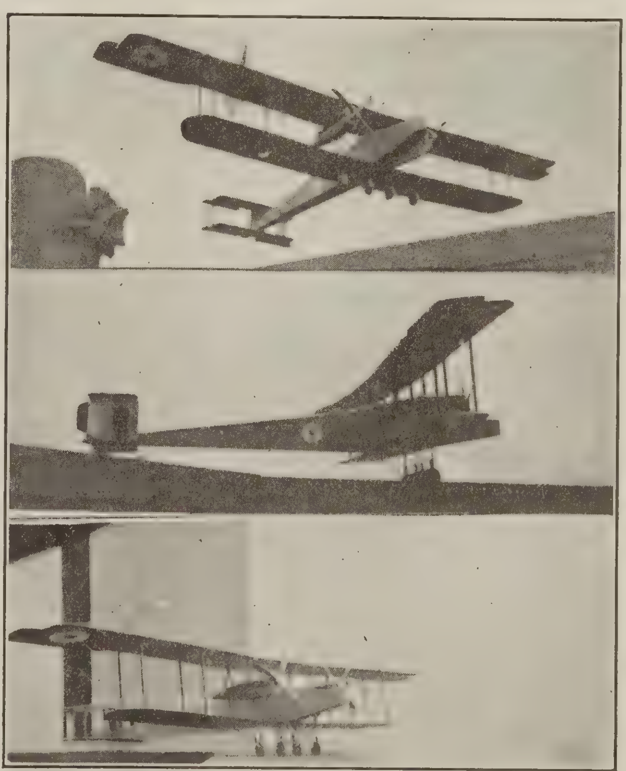
This model should be of unusual interest at the present time because of the talk going around in Aviation circles of the proposed crossing of the Atlantic Ocean, by large fleets of Bombing Machines built in this country, and then proceeding to the Western Battle Front to rain bombs on the Hun.

The Handley-Page is one of the machines that has been mentioned in connection with this flight and it may have the honor of being the first to cross.

The model is made of wood and the construction is much the same as the other models shown previously.

A model of this kind attracts considerable attention when placed on exhibition and the builder of a model of this type should get a good deal of pleasure out of the building of it as well as the profits from selling models of this kind as an advertising medium.

The model was constructed from data appearing in AERIAL AGE.



Three views of a model of the Handley-Page machine

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Tragedy in Two Acts

Place: Houston.

Time: Friday.

Characters: Inspector-General and Unknown Cadet.

Act One—Unknown Cadet meets Inspector-General on street and fails to salute.

Inspector-General: "What is your name?"

Unknown Cadet (thinking fast): "Johnson of the Fifth Cadets, sir."

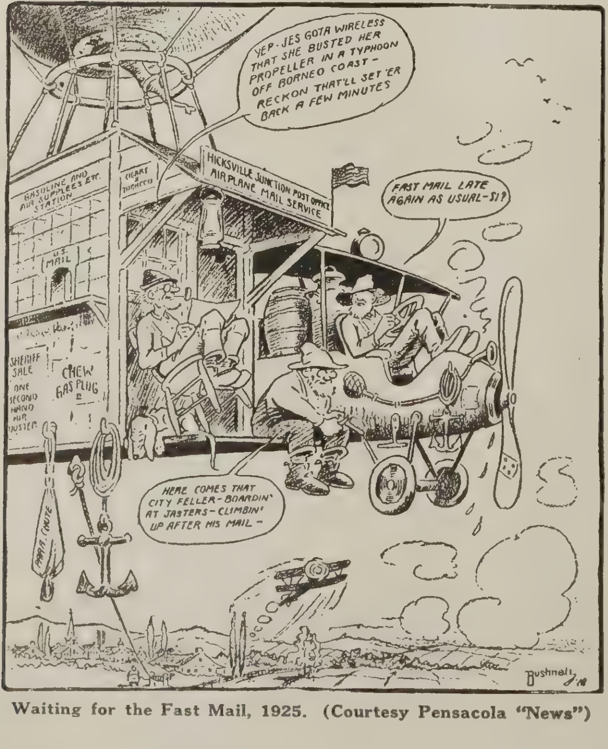
Act Two—Notice on squadron bulletin board: "Cadet Johnson confined to the Post for a period of one week for failing to salute an officer in Houston Friday."

Sequel: Cadet Johnson didn't even have a pass for Friday.

Greys Elegy (Royal Air Force Edition)

Reveille sounds the knell of opening day;
The Leyland lorries rumble o'er the lea;
The sergeant messwards plods his hungry way
And leaves the camp—ye gods—in charge of me.
And now the C. O. stalks upon the sight
And all the air a solemn stillness holds,
Save where the Sopwith wheels his droning flight
Or slackers tremble 'neath their blanket folds.
Beneath that canvas flap, that marquee's shade
Comes sounds of snoring, sonorous, loud and deep;
Each in his narrow bed till noontide laid
The sergeant-majors of the Squadron sleep.
The breezy call of incense breathing morn
The whirr of Monosoupes overhead
The comely W A A C's who glide among the corn
Can never rouse them from their snug soft bed.
Far from the madding crowd's inglorious game
Their sober wishes never learn to stray.
Be up and doing—nothing, they exclaim,
And earn an "even tenner" on their way.
And so the weary game meanders on
(I wonder if my bally breakfast 's laid)
Fried bacon will be good to gaze upon.
And then—Oh Help—I've missed the Staff parade.

—*Flying.*


YEP - JES GOTA WIRELESS THAT SHE BUSTED HER PROPELLER IN A TYPHOON OFF BORNEO COAST - RECKON THAT'LL SET 'ER BACK A FEW MINUTES
GASOLINE AND AIR SUPPLEES ETC. STATION
CIGARS & TOBACCO
HICKSVILLE JUNCTION POST OFFICE AIR PLANE MAIL SERVICE
FAST MAIL LATE AGAIN AS USUAL-SI?
U.S. MAIL
SHERIFF SALE ONE SECOND HAND AIR DUSTER
CHEW GAS PLUG
HERE COMES THAT CITY FELLER - BOARDIN' AT JASTERS - CLIMBIN' UP AFTER HIS MAIL -
PARA. CHUTE
Bushnell '18

Waiting for the Fast Mail, 1925. (Courtesy Pensacola "News")

Learning to Fly

By "A Cadet"

One day I think all the instructors here are crazy, and the next day I get to wondering whether I am not the crazy one. You really can't blame them much for being nervous and high-strung. It is a ticklish job to have to ride in the same machine with these wild cadets.

Instructors are of two classes—cussers and non-cussers. They all are in the first class.

Instructors put cadets into two classes also—boobs and nuts. The boobs are nuts that have been coached.

When the instructor asks you "what in the name of h—— are you trying to do; wash your shirt?" he means, in gentle parlance, that your washboard tactics on the elevator control are not apropos.

My instructor hasn't told me yet to hitch my wagon to a star when the gasoline runs out, but this is the only thing he has omitted. He admires my gentle, caressing touch on the controls and tells me I drive like an old woman. He is sure I will make a good flier when they design planes that will fly and land alone.—*Rockwell Field Weekly Flight.*

"Allied Raid on Cologne Kills 146."—*News headline.*

Incidentally, the allied raid on Cologne shows that sauce for the gander is sauce for the goose.

U. S. will trust foe not to sink hospital vessel—will send the Comfort through the U-boat zone without armed convoy. —*Headline.*

Bombs kill nurses and men in German raid on hospitals—enemy fliers deliberately drop flares to identify Red Cross buildings before throwing down their missiles on wounded. —*Another headline on the same page of the same paper.*

Camouflage

An aerodrome recipe for camouflaging a Caproni: "Paint it all over with Scotch jokes. The Germans could never see them.

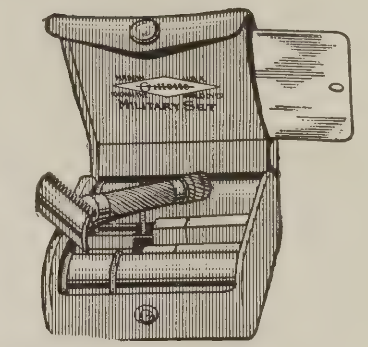
N. B. Scottish readers are informed that it is entirely unnecessary to write the Editor a letter of protest. This has already been attended to.

It's a Wise Bird that Steers Clear of American Aviators

When the American aviation camp was first opened, it was noticed that the birds were imitating the flight of the machines. A group of aviators were seated on the ground one day, when, to their surprise, they noticed a flock of about fifty larks flying near a machine. The machine did a bank to the right, and the birds followed. One to the left—the birds did likewise. A short nose dive—the birds all dived together. Then the plane mounted higher, followed by the birds. It went into a stall, then a "Vrille." The birds tried it and were dashed to the ground. They had never tried that before!—*From a letter from France.*

Gillette SAFETY RAZOR

The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

War service is throwing the spotlight on the Gillette

There are mighty few personal belongings a man in the Service can pack around—and the greatest of his comforts is his Gillette.

Wind-chap, sun-burn, cold water, cold weather only give the Gillette a bigger opportunity to show *service.*

There isn't a mile of the battle-fronts, nor a ship of the Allied Nations, but has its Gillette users by the tens and the hundreds. The compact, portable razor that can always be depended on for *service.*

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

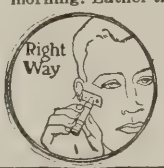
Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

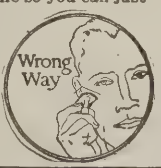


Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down tight. If you want a specially close shave, unscrew the handle a part turn.

Hold the razor naturally and easily, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

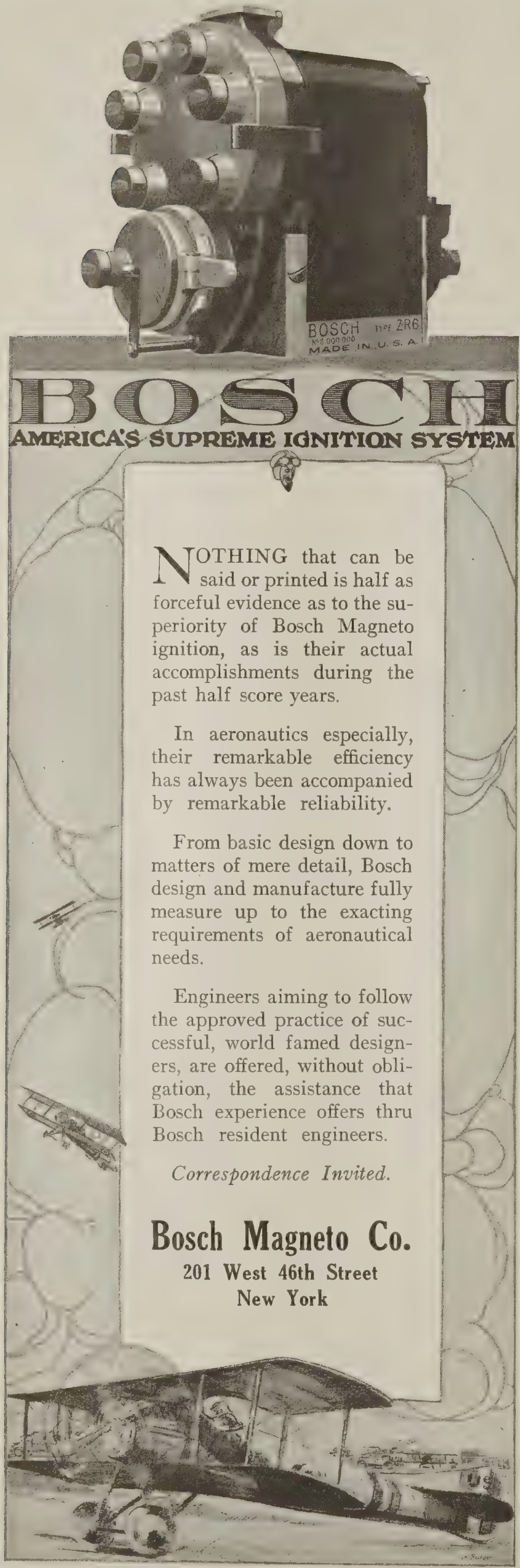


Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·



BOSCH
AMERICA'S SUPREME IGNITION SYSTEM

NOTHING that can be said or printed is half as forceful evidence as to the superiority of Bosch Magneto ignition, as is their actual accomplishments during the past half score years.

In aeronautics especially, their remarkable efficiency has always been accompanied by remarkable reliability.

From basic design down to matters of mere detail, Bosch design and manufacture fully measure up to the exacting requirements of aeronautical needs.

Engineers aiming to follow the approved practice of successful, world famed designers, are offered, without obligation, the assistance that Bosch experience offers thru Bosch resident engineers.

Correspondence Invited.

Bosch Magneto Co.
201 West 46th Street
New York

General Pershing Protests Against Untried Aircraft

The New York *Herald* states that: "General Pershing has cabled the War Department protesting against the shipment to Europe of De Haviland 'Four' planes which have not been thoroughly tested in this country, according to information received by members of the Senate Military Affairs Sub-Committee engaged in investigating the aircraft situation.

"The report caused considerable anxiety among members of the committee, who interpreted it as an indication that serious difficulty had been encountered in the use of the machines being sent to France. The House Military Affairs Committee was told last week that 200 De Haviland aeroplanes had gone to France, and the information was given considerable currency about the capital as evidence of a better day in the aircraft programme.

"Members of the Aircraft Investigating Committee say they had learned that 478 De Haviland planes had been sent to France. The cause of General Pershing's complaint was not clear to members of the committee, and they were determined to continue their investigation to ascertain whether it was the result of faulty construction which might be remedied in future production.

"The De Haviland 'Four' is the type of plane upon which the United States was placing its chief reliance. Arrangements had been made for turning them out in large quantities for use as combat planes on the western front.

"The action of General Pershing added new impetus to the demand among members of the Aircraft Committee for the taking over of the three principal aircraft factories by the government. The committee has been considerably disturbed by the frequent reports of aircraft accidents in the American army and is now awaiting a detailed report from the War Department on the subject.

"It has also found undesirable conditions in several of the larger aircraft factories which it believes could be removed under federal control. Members of the Aircraft Committee expect to go to Langley Field, at Norfolk, within a day or two to inquire more thoroughly into the cause of the accidents. Several members blame the weight of the Liberty motor for many of the fatal accidents recently. They believe that the finding of the Senate Military Affairs Committee reported last winter to the effect that the Liberty motor is not suited to light combat planes still stands."

Caproni Ready for Trans-Atlantic Flight

Lieutenant Leopoldo Belloni, of the Royal Italian Flying Corps, has advised the Aero Club of America that Mr. Caproni, the famous Italian aeroplane constructor, is ready to undertake the trans-Atlantic flight and the plan was considered at a meeting of the Executive Committee of the Club.

Lieutenant Belloni advised Mr. Alan R. Hawley, the president of the Club that Caproni has the machines capable of making the flight and hundreds of aviators who are ready to undertake the flight. Mr. Caproni is ready to send to the United States a machine capable of making the trans-Atlantic flight, or build such a machine in the United States on Caproni's plans.

Lieutenant Belloni agreed with the Executive Board of the Aero Club that the value of the trans-Atlantic flight is in being able to do it again one thousand times in six months and ten thousand times in one year. This, he said, would be entirely possible.

Caproni can undertake to establish an American factory, or have the machines built at existing American factories by the thousand.

Lieutenant Belloni stated that, having the aeroplanes and the pilots, the rest was a matter of faith, skill and organization. They have the first two, and if the American Government or the Aero Club will supply the latter, the flight can be made this year.

The Executive Committee of the Club is transmitting the Caproni plan to the Washington authorities, urging that Caproni's offer to bring over a trans-Atlantic aeroplane be accepted and Mr. Caproni be officially invited to do so through the Italian Government.

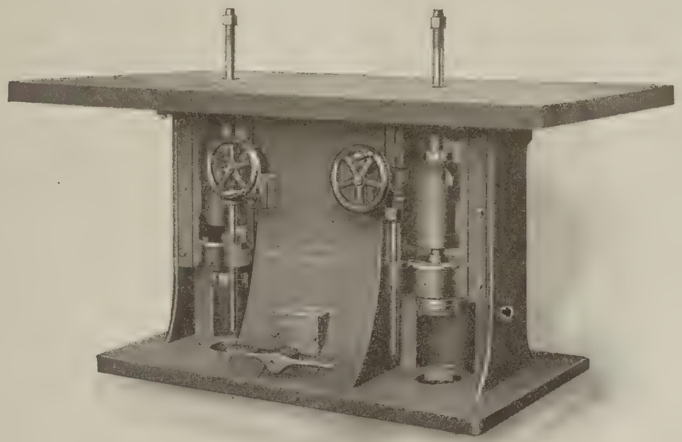
The following telegram was received asking the Club whether it can undertake to deliver from three to four thousand pounds of saccharine to London by aeroplane:

"A very important London firm cabled request to obtain estimate cost of shipping three or four thousand pounds saccharine to London by aeroplane or seaplane. Willing to pay substantial amount as price for Red Cross Fund. In explanation, this cable inquiry, is fact that saccharine is very scarce and much wanted in London due to sugar shortage. We are unable to obtain ship space to England. Wire what is possible cost and any other particulars.

(Signed) MONSANTI CHEMICAL WORKS."

Whitney Direct Motor Driven Double Spindle Shaper

The HIGH SPEED MOTORS are mounted directly on Spindles. (No Gears.)



No. 39. Direct Motor-driven Double Spindle Shaper.

No Countershaft required.
No belts to buy.
Saves power and floor space.
Can be placed anywhere, regardless of shafting.
Speed of spindles, 4,500 to 10,000 R.P.M.
The Shapers are made for heavy, medium and light work.

Write for facts and figures about this Shaper

BAXTER D. WHITNEY & SON
Winchendon, Mass.

AEROPLANE TO BRING VICTORY TO ALLIES

By GEN. J. M. G. MALLETERRE

THE lull on the French front persists, at any rate so far as it concerns the new German offensive against the British. The British, French and American troops, however, are not inactive. Not only have they stopped numerous German raids aimed at sounding the Allied line, but they have executed brilliant successful detailed operations which show their keenness.

The Americans at Chateau-Thierry, the British in Flanders and the French in the interesting advance they have just made west of Soissons between Ambleny and Cutry show themselves prepared to answer the German attacks.

Ludendorff Must Attack

There is no doubt that Ludendorff is preparing a new offensive. As I said in my last article, he is condemned to the attack through the economic and political situation in Germany. But he must have been embarrassed by the recent Austrian defeat in Italy, by the seriousness of the alimentary crisis in Austria-Hungary, by the Bolshevik troubles agitating Russia and by the ever-increasing difficulties within the German Empire itself. He cannot hope for a sensational surprise like that of March 21 and that of May 27. The Allied high command is on its guard.

It must not be forgotten that Ludendorff still holds the better strategical position and has the greater facilities of manoeuvre for attacking masses.

Big battles are to be expected in the summer months. Where will they take place? Perhaps on every front. But one must look attentively to certain rivers exercising attraction for the Germans—the Marne, the Oise and the Meuse.

Activity in the Air

Ludendorff must be hindered in his plans by the Allied aviation forces. The communiques speak of incessant bombardment of the German rear lines. Yet they do not say everything that could be told. It must be admitted that German aviation does the same behind our lines. They always take advantage of the night. In daylight German aviation is completely handicapped. Its activities have carried the enemy even to Rouen, and its bombers have attacked without respite the Channel ports and towns bordering the front.

Gothas have returned to bomb Paris, making the forty-sixth raid. London, however, has fared even worse.

Aviation is playing its role, and there is no reason to cry out against barbarity nor for reprisals. Barbarity and reprisals are old newspaper stories.

This war, as the German war doctrines made it, is founded on terror and extermination. The Germans showed this in the first days of the Belgian invasion. The Germans still imagine after four years of war that they can terrorize and demoralize armies and nations by using all kinds of destructive power and by barbarous treatment of prisoners and populations of invaded regions.

More and More Terrible

The role of aviation has grown during the war through the technical progress of fabrication. The aeroplane is becoming every day a more and more terrible fighting weapon. Aeroplanes can be divided into three classes, chase, reconnoitring and bombardment. In its last named category the aeroplane has become a decisive factor in the war. With machine guns and small cannon it takes part in the fighting as much as the soldiers, as was seen in the last battles in Picardy, when escadrilles held and even scattered enemy columns and convoys.

With the ever increasingly dangerous bomb, the aeroplane carries the war far into the enemy's country, destroying stations, railways, places where troops are concentrated, and munition factories. This is not a case of reprisal. This aeroplane action is part of the battle, is on the battlefield itself and the lines of communication.

There is no doubt of the superiority this intervention will bring to the high command, which knows how to handle it to certain victory. The Germans have pretended to extend the reprisal question in bombarding regions outside of the army zone. They naturally protested when Allied aeroplanes attacked the Rhine cities. We recognize their usual duplicity and perfidy.

We will not reopen the question proving them the first to start the bombing, so to speak, of open cities. Taubes were seen flying over Paris in 1914. London was attacked in 1915. Paris and London, the Germans say, are military objectives. We agree. Unhappily they are within reach of bombardment, since the invasion of Belgium and France.

Carry War to Germany

Germans had hoped the distance of the Rhine cities would preserve them from the Allies' attack. Being invaders, they felt certain they would be immune from invasion. Aviation at last has carried the war into Germany. When bombardments sow destuction, death and terror beyond the barricades the enemy believed impossible, they are not waging war on "inoffensive" people.

Italian aviators are doing the same on the Venetian front.

Let us not forget that it was through invasion that Germany got the mines from us in Northern Lorraine with which she keeps up the fight. Munition factories all over Germany, wherever one can strike her, will be legitimate in the terrible game of war.

For the moment Allied aviation is most active in the battles themselves. This is necessary. But the day is not far off when it will be extended with formidable efficacy to German soil. Then the end of the war will be near.

When to the admirable American soldiers shall be added innumerable escadrilles, the Allied high command will show to the Allied peoples as well as the German people why it was patient, and why without too hasty a reply it has put up with Ludendorff's offensives. It knows victory is in the hands of its soldiers and on the wings of its aviators.

American Airmen in France

Dispatches from the American Front in France concerning July 5th, indicate that there was considerable activity in the air on that day. Three German machines were brought down by Americans. Credit is given for their destruction to Lieuts. John Witchell, R. A. O'Neill, J. C. Raible and D. W. Cassard. It is reported that the destroyed German machines were part of the famed Richthofen "Circus." Photography and reconnaissance was carried out successfully. Two American aviators, Lieuts. W. D. Robbens and John Wilford, were brought down in flames.

Flying Field Named in Honor of Col. Bolling

Washington, July 5.—The army flying field in this city, which serves as the terminal of the New York-Philadelphia-Washington aerial mail service, has been named Bolling Field, in memory of Colonel Rynal C. Bolling, of New York, who was killed in action in France during the German drive last March.

CONTRACTORS TO

The United States Army and Navy The British Admiralty

THE BURGESS COMPANY
MARBLEHEAD, MASS.

Sole Licencees for the United States
for the Dunne Patents

Members of the Manufacturers
Aircraft Association

High Class Men of Engineering Experience Wanted

The following letter from Major Torney speaks for itself:

From: Section of Gauges and Standards,
Bureau of Aircraft Production.
To: AERIAL AGE WEEKLY.
Subject: Advertisement.

1. *The Section of Gauges and Standards of the Bureau of Aircraft Production is in need of high-class men who have had engineering experience, preferably along mechanical lines.*

2. *The nature of the work is in connection with the establishment of standards and the production of gauges and small tools used in constructing aeroplanes, engines and materials pertaining thereto.*

3. *This is an excellent opportunity for men who are anxious to serve their country—to do their bit—and this call cannot help but appeal to men of high character and attainments.*

4. *Anyone desiring to make application can obtain all necessary information from the Section of Gauges and Standards, Office, Room No.* 2610, 165 *Broadway, New York City, on Monday, Tuesday, Wednesday or Thursday, the* 8*th,* 9*th,* 10*th and* 11*th instants.*

By direction of the Director of Aircraft Production.

(*Signed*) H. W. TORNEY,
Major, A. S. Sig. R. C.

Flying Bombing Planes Across the Atlantic

(Editorial in the New York *Times*)

The short cut to an acceptance by the War Department of Mr. William H. Workman's plan to build 10,000 Handley-Page bombing aeroplanes and fly them over the Atlantic to the western front is to take across at once, or as soon as arrangements can be made, one of the most powerful standard planes made by the British company. An exhibition plane (British in design and American in construction) made its début with striking success at Elizabeth, N. J., on Saturday afternoon in the presence of Assistant Secretary Crowell and Mr. John D. Ryan, head of the Aircraft Production Board. With a wing spread of 100 feet, and driven by twin Liberty motors of 400 horse power, this great machine, carrying six persons, one of them Major Gen. William L. Kenly, Chief of the Department of Military Aeronautics, functioned as smoothly as a scout plane and attained a speed of ninety to one hundred miles an hour. Well might Assistant Secretary Crowell call it "a magnificent performance." And it was particularly a triumph for the Liberty motor, which is so well thought of in England that the makers, it is said, will never be able to deliver enough of these engines to our ally. But the question remains, could the Handley-Page bombing machines be flown across the Atlantic—let us say, in flocks? And if that were practicable, would it pay? Every hour of the life of an aeroplane motor on the western front is precious. It has been said that, while some motors have lasted 300 hours in operation, the average is very much lower. Mr. Gutzon Borglum says that "the life of an engine is somewhere between 50 and 150 hours." The wear and tear of a forty-odd hours' flight from America to France should not be disregarded by the enthusiasts. Whatever it was, it would be saved by transportation in the usual way. A ship carrying planes and engines might be torpedoed, it is true; on the other hand, some of the bombing machines attempting the Atlantic passage would never reach the other side.

Mr. Workman is indignant because the War Department is cool toward his project. It cannot be indifferent to his bombing plane as a terrible war weapon; certainly not after the exhibition given at Elizabeth. Seeing is believing; and then it is well known that the British planes are playing havoc by dropping tons of explosives every day behind the German lines; railway stations are dismantled, supply trains wrecked, ammunition dumps blown up, troop concentrations stopped, and on the coast submarine bases shattered. The War Department is familiar with these facts, and wants all the bombing machines it can acquire and as quickly as deliveries are practicable. And, of course, it is mainly on the western front that these destructive machines are wanted.

"Thousands of Bombing 'Planes"

(Editorial in the New York *Tribune*)

At the launching of the huge Handley-Page bombing 'plane, built at Elizabeth, N. J., Mr. John D. Ryan, the new head of the Aircraft Production Board, made this terse observation:

"I am glad to say that thousands just like this one (the Handley-Page)—one of the most powerful ever built—are under construction, all to be driven by the Liberty motor, the best and most powerful aeronautical engine ever built."

This new machine is equipped with two Liberty motors, developing together over 800 horsepower. It is a companion to the type of machine that last fall, under the guidance of an American pilot in England, carried a total of twenty-one passengers to a height of 7,000 feet. It will be able to carry, besides two pilots and perhaps two gunners, a matter of a ton and a half to two tons of explosives.

Note that Mr. Ryan says that "thousands of 'planes" like this are being built. The new head of the air board has been notably reticent in any expression of opinion since he took office. Mr. David Lawrence, the correspondent of The *Evening Post,* observes that Mr. Ryan has for three months refused to say a word as to the work or plans of his department.

"He made a thorough study, however, of the happenings prior to his own appointment, and satisfied himself as to the truth or falsity of the public criticism. What Mr. Ryan says when he speaks thus is in a sense judicial, and on his statements the country can base its judgment about the status of the programme to-day and the outlook for the future."

Obviously, Mr. Ryan would have no wish to prejudice the report of ex-Justice Hughes on the work of the aircraft board, which is now in preparation. It is significant that he gives his unqualified indorsement to the Liberty motor as "the best and most powerful aeronautical engine ever built." In this he but repeats what he said the other day at Detroit.

We apprehend that the day is not distant when the achievements of the aircraft board, so scandalously maligned, will come to rank with the shipbuilding work as perhaps America's greatest contribution to the war. It is evident enough that only an intensive and splendid work could, after a single year, make possible quantity production of the best and most powerful aeronautical engine ever built.

AERIAL AGE WEEKLY

Vol. 7, No. 19 JULY 22, 1918 10 CENTS A COPY

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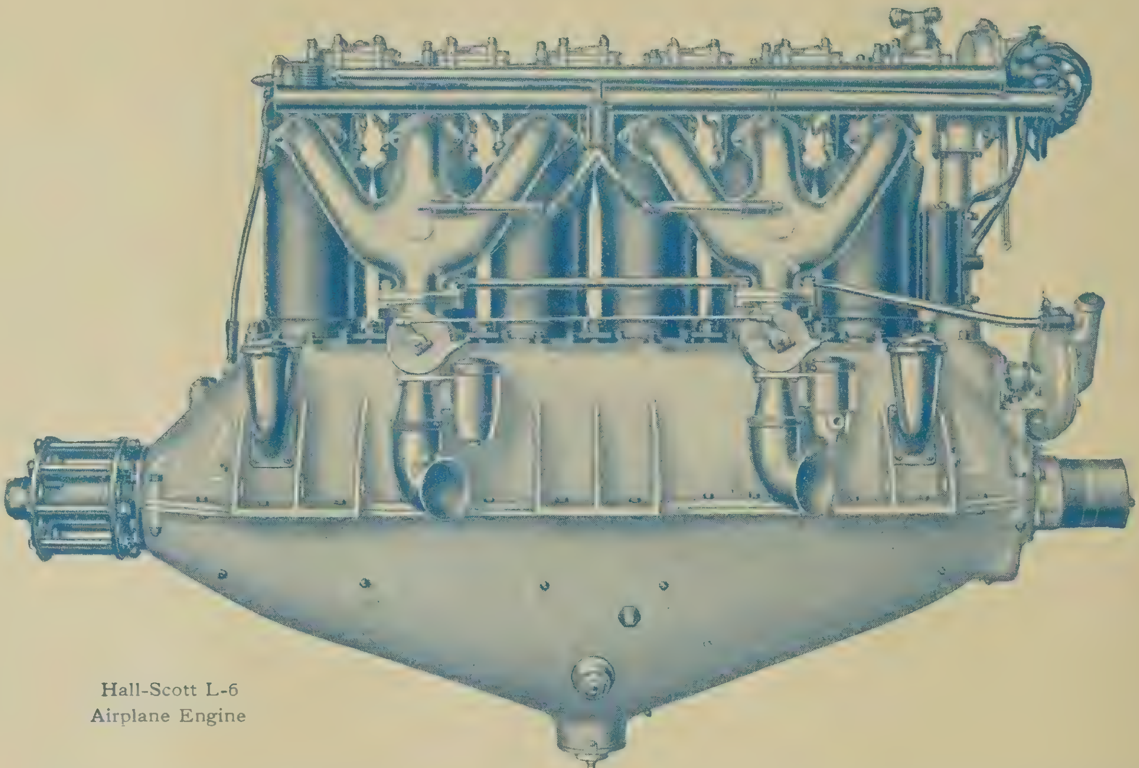
An evening flight at one of the American training fields

NOTICE TO READER
When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
NO WRAPPING—NO ADDRESS
A. S. Burleson, Postmaster-General

German Drive Shows Need of Thousands Additional Warplanes

HALL-SCOTT



Hall-Scott L-6
Airplane Engine

THE L-6, the latest development of the Hall-Scott Motor Car Company, is pictured above. This motor has been designed by Hall-Scott Engineers and produced with a full appreciation that—

A successful automobile motor does not make a successful Airplane Engine and that—

America should and can produce a sturdy, dependable Airplane Engine that would give better service in the hands of American flyers and American mechanics than any of the delicately made equipment of foreign design and construction not adapted to American manufacturing methods.

This type L-5 embodies all of the superior points of the widely known type A-6 and A-5a models, and in addition, the latest features in Airplane Engine practice. This engine has been given thorough running tests under official observation, showing power delivery well in excess of its rated 200 h.p. with a total weight under 500 pounds. Cylinders have a bore of 5 inches and a stroke of 7 inches. Production for one of the Allies has already started.

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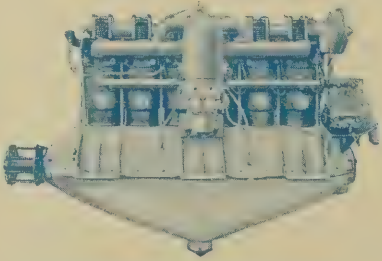

Hall-Scott A-5 Airplane Engine

THE Hall-Scott Motor Car Company has the plant, the equipment and the organization for a daily production of twenty engines and the facilities to further increase this production if necessity demands.

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GERMAN DRIVE SHOWS NEED OF THOUSANDS ADDITIONAL WARPLANES

THE German drive shows the need of thousands of additional warplanes. With additional bombing planes the transportation of additional German troops and supplies could be prevented by wrecking the bridges on the Rhine and keeping them down, so that German railroads could not operate. The transportation and concentration of troops and military supplies and military formations behind the lines could also be prevented.

An idea of what can be done provided the Allied aviators have the aeroplanes is given in the following despatches:

London, July 13.—British airmen continue to show their superiority over the Germans. After their record of last week, when they accounted for 218 enemy machines against 56 of their own and dropped 252 tons of bombs on German communications and depots, they made this week fourteen separate raids into German territory, their objectives chosen being of vital military importance.

It is known that formidable squadrons have been detailed for the purpose of defense. Yet from thirteen of these fourteen raids the British formations returned without the loss of a single machine. In the other raid two British machines were reported missing, while four German aircraft were shot down or driven down out of control.

The raided area between Mannheim and the Swiss frontier contains a vast network of strategic railways and a very considerable number of munition factories. These factories have had their full share of attention from the British raiders, but hardly less serious, from the German viewpoint, is the damage inflicted upon railway connections on which the immense German transport from the Rhine to the western front depends. On this point the evidence of captured documents and the voluntary testimony of prisoners and repatriated civilians are highly instructive. Not only is a great and ever-increasing amount of German energy and trained man power and war material being diverted to the defense of the Rhine towns, but the interruption of war work is becoming an increasingly serious problem.

Paris, July 15.—The first day of the offensive was a big defeat for the enemy, says the Havas correspondent on the French front.

French aviators were very active in harassing the enemy and destroyed two bridges loaded with German troops.

Our Allies are doing and have been doing everything they can to increase their air service; they have gone as far as their resources permit. It is now up to the United States to do likewise.

We know that to keep an aviator in the air in the war zone we must supply him with an average of one machine per month with spare motor and spare parts.

We also know that to meet the situation in its fullness we must aim to keep at least 5,000 aviators on the fighting lines, which means supplying 5,000 warplanes each month, or a total of 60,000 war planes in a year, as pointed out by Mr. Henry Woodhouse in his testimony to the Senate Committee on Aeronautics last week.

Fortunately we now have the organizations and the funds carry out such a program. The Department of Military Aeronautics and the Bureau of Aircraft Production have gotten together in their staffs some very able and energetic men who are ready to take care of a program several times larger than the present program.

* * *

On July 15 Secretary Baker announced that 450 American-built battle planes had been sent abroad or delivered at ports for shipment on July 5, the date of the latest complete official report reaching the War Department.

In announcing this figure Secretary Baker disclosed also that deliveries of Liberty motors of all classes on the same date had reached 2,514.

* * *

The appropriation bill signed by President Wilson on July 1st carries close to one billion dollars for aircraft. It may be said that the appropriations are unlimited. Both Houses of Congress are ready to vote any amount that can be shown to be necessary for the building of our air forces. Like the American public as a whole, Congress is willing to do anything to assist the building of our air forces.

BRITISH IN A YEAR DOWN 4,102 PLANES

BRITISH LOST 1,121 CRAFT

American Output Expected to Give to Allies Great Advantages from Command of Air

A dispatch from London giving a summary of aerial operations says: During the year ending June 30, 1918, 2,150 enemy aircraft were destroyed by the Royal Air Force on the western front while 1,083 enemy aircraft were driven down out of control. The Royal Air Force units, working with naval airmen, shot down 623 enemy aircraft.

During the same period 1,094 British machines were reported missing, including 92 which were working with the navy.

Thus in the north during the year the British aviators alone have accounted for no fewer than 3,856 enemy machines.

On the Italian front during the period from April to June of this year the British destroyed 165 enemy machines and drove down six out of control. The British machines reported missing were thirteen.

On the Saloniki front, between January and June, twenty-one enemy aircraft were destroyed and thirteen were driven down out of control. The British machines reported missing were four.

From March to June in Egypt and Palestine twenty-six enemy aircraft were destroyed and fifteen driven down out of control. Ten British machines were reported missing.

Thus, during the present year, in these outside theatres of war 246 enemy aircraft were accounted for, while 27 British machines were reported missing.

From July 1, 1917, to June 30, 1918, therefore, the British brought down 4,102 enemy aircraft. The British machines missing number 1,121.

One fact emerges clearly from the record of aerial operations, and this is that the British superiority and strength in the air in all the theatres of war have progressed rapidly and continuously. From this it should be safe to assume that when the new factor of America's output, both of aircraft and personnel, begins to enter into the situation actually in the fighting zones, the aerial ascendency of the Entente Allies should give them very great advantages.

$50,000 TRANSATLANTIC FLIGHT PRIZE RENEWED

FOLLOWING the offer of a $10,000 trans-Atlantic flight prize by the Aero Club of America, the London *Daily Mail* has renewed its $50,000 prize for the same purpose. The cable announcing the renewal was received on July 15 and reads as follows:

"In order to stimulate the production of more powerful engines and more suitable aircraft," the "Daily Mail" announces the revival of its offer of a prize of £10,000 to the first person who flies across the Atlantic from any point in the United States, Canada or Newfoundland to Great Britain or Ireland, or vice versa, in seventy-two consecutive hours.

The original offer of the *Daily Mail* was made in April, 1913. It was suspended at the beginning of the war.

40 Army Aviators Ask Permission to Be in the First Fleet to Cross the Ocean

Forty American aviators of the First Provisional Wings unit at the army aviation field at Mineola, rated as the best-trained pilots in service on this side, on July 15 presented to their commanding officer a petition requesting that they be selected to fly the first fleet of American-built Caproni or Handley-Page bombing machines across the Atlantic under the plans proposed by the makers of both types of aeroplanes. These are the same men who thrilled the city by their skillful flights in battle formation on July 4 and Bastile Day, and who have been enacting sham battles at many places.

In addressing the aviators upon their proposal, Major C. K. Rhinehardt, commanding officer of the aviation field, said that he believed that the plan of flying aeroplanes from America to Europe was feasible, and he added that he believed the flight would be undertaken before the end of the year in planes built in America and equipped with the Liberty motor. He told them that he wished to make the flight himself, and that he was desirous to have his name added to the list of Americans volunteering for service in the first overseas squadron. It is probable that the petition, with the approval of the commanding officers of the field, and with their names added, will be forwarded to the War Department.

Most of the men who volunteered for the flight have received training in the flying of the huge American-built Caproni and similar machines here, and officers at the field said that the men were qualified to fly that type of aeroplane. Under orders they are continuing their study of the Caproni planes here, and it was announced also that a detachment of the men had been sent to the flying field of the Standard Aircraft Corporation at Elizabeth, N. J., to study there the mechanism and flying qualities of the giant Handley-Page aeroplane that was turned over to the War Department with impressive exercises on July 6.

This machine has a wing spread of 100 feet and is propelled by two Liberty motors of 400 horsepower each. Lord Semphill and other expert British pilots will show the Americans every trick of the huge machine and every pilot will make flights in it or in other planes of the type. All of the pilots in the First Provisional Wings will rotate in studying this plane and the Caproni at the army field here.

Major Rhinehardt and other officers at the field said they were sure that the flight would be undertaken within a few months, and that some of the machines in the first fleet would be flown by American aviators, although Italian, French and British aviators attached to the field here are anxious to pilot one of the first planes. He said that the American army officers favored the route from Newfoundland to Ireland, instead of flying to the front by way of the Azores and Portugal. The Americans wish to fly the planes from the factories to Newfoundland, and then make the jump of 1,860 miles to Ireland, and thence to the front. They have suggested also that a string of ships be placed at 200-mile intervals along the route, so that the pilots would be guided accurately in their swift flight and have facilities to repair their planes in case of accidents.

Before his death here two weeks ago Sergeant Gianfelice Gino, the Italian pilot who was instructing Americans in the flying of the big Capronis, asserted repeatedly that he concurred in the opinion of the late Captain Resnati and other pilots that the flight across the ocean could be made, and that no better men for the undertaking could be found than the experienced pilots at the field here with the young Americans who have become expert flyers under their instruction.

The forty pilots in the First Provisional Wings who have volunteered for the flight have all taken long cross-country flights, have been in the air a greater number of hours than have other pilots, and have become expert in the flying of battle and reconnaissance planes, as well as the big Caproni bombing planes. They are the men who thrilled the city with their daring flights on July 4, Bastile Day, flew over the Mitchel cortege, and have been giving demonstrations of air battles.

In sending their petition the Wings said that their request did not lessen their desire to pilot battle planes at the front, and that they were anxious to see service over the lines if it is decided that they have acquired the proficiency in the handling of the bombing planes necessary for the Atlantic flight. Many of them are pilots who have been withheld from overseas service, however, because they had qualities needed for the experimental work with the bombing planes.

Commanding officers at the field expressed great satisfaction that the men under them were anxious to make the first flights across the ocean, and said that the desire to undertake hazardous flights for the good of the service had been typical of all the pilots who have been passed to France through the aviation schools here. In addition to Major Rhinehardt, the men who have volunteered for the flight are Captain S. H. Harvey and Lieutenants F. C. Davidson, M. B. Kelleher, L. S. Reitenbaugh, J. P. Boyd, S. M. Connell, H. C. King, J. I. Hoare, N. E. King, E. J. Rose, H. M. Stoffregen, W. A. Boggs, J. Y. Longstreet, E. S. Muntford, J. W. Meany, J. I. Moore, F. B. Welch, P. F. Hauser, W. A. Henderson, H. C. Garratt, W. Benner, U. G. Jones, Earl Carroll, K. L. Clark, E. K. Merritt, A. H. Halley, B. J. Hanson, J. A. Orb, J. P. Roullet, S. S. Hunt, G. C. Book, J. H. Pearson, D. H. Hinman, A. F. Brokmeyer, M. G. Cleary, J. K. Sherman, L. S. Lockwood, A. H. Krigger, and F. W. Green.

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

BY sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aero post service each, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M.		A. M.		A. M.		A. M.
G. P. O.	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq.	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times	10.40
D	10.20	O	10.35	Y	10.30	Tomp	9.40
F	10.30	P	10.20	College	10.05	Tremont	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent.	10.55	Wash.	9.46
I	10.20	T	8.35	H. G.	10.00	W. F.	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only three cents (3c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making sixteen (16c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.

THE NEWS OF THE WEEK

Progress of Aircraft Program

A summary of the developments of the military Establishment of the United States in the fifteen months since Congress declared war against the Imperial German Government is given by Secretary of War Baker in a letter to Chairman Dent of the House Committee on Military Affairs, dated June 28, 1918, and made public on July 4. The letter was in reply to one from Mr. Dent of June 27, reminding the Secretary that just a year had elapsed since the first American troops were landed in France, and suggesting such a statement. Regarding aviation Mr. Baker gives the following facts and figures:

Deliveries of elementary training planes to June 8 were 4,495.

Deliveries of advance training planes to June 8, 820.

The average weekly production of advanced training planes during April was 22; during May, 45; week ended June 8, 78.

To June 8, 285 combat planes were delivered. The weekly average of this type of machine in April was 5; in May, 38, and for the week ended June 8, 80.

Six thousand eight hundred and eighty training engines were delivered to June 8.

Two thousand one hundred and thirty-three advanced training engines were delivered to same date.

More than 2,000 Liberty engines have been delivered to the army and navy. The average weekly production in April was 96; in May, 143, and in the first week in June, 115.

Thirty-seven thousand two hundred and fifty machine guns were delivered for use on aeroplanes before June 8.

Call 3,000 Draft Men for Spruce Wood Corps

Washington, D. C., Friday.—Provost Marshal General Crowder to-day issued a call for an additional 3,000 men from thirty-eight States to produce spruce wood in the forests of the Northwest for airplane construction. From Class 1 only men who are qualified for special or limited service will be accepted. These, as well as registrants in the second, third and fourth classes qualified for general military service, may volunteer until July 23.

Aeroplane Plant for Y. M. C. A.

General Irenée du Pont, on behalf of the Delaware Aeronautic Company, has offered to the School of Aeroplane Mechanics of the West Side Branch of the Y. M. C. A. the entire plant and equipment of the aeroplane plant at Claymont, Del., which includes machinery and several aeroplanes. He has already given the school an aeroplane.

Air Officers Must Fly

Washington.—Only officers who have qualified as junior military pilots hereafter will be given appointments in the military aeronautic division, under a ruling by Major General Kenly, director of the reorganized air service.

At present there are many officers in the non-flying branches of the service, which includes all administrative and staff work, and plans are afoot requiring all officers now on such duty in Washington to learn to fly. A flying field being established near the city probably will be used for this purpose. The flying qualification rule applies only to the operating end of the air service. It does not include officers of the aircraft production division.

Used Carrier Pigeons

Trenton, N. J.—Lieut. George Leisure of New York City, piloting a Curtiss biplane, accompanied by two other aeroplanes, from Mineola to Princeton, fell on the farm of John M. McDonald, a New York banker.

In falling Lieut. Leisure managed to manipulate his plane so that he escaped death, although the machine was badly wrecked. His face was badly bruised. He released a half dozen carrier pigeons and started them on their way back to Mineola, telling of the mishap.

Belgian Rulers Fly Over Channel

London.—Guarded by a royal air escort of three Belgian seaplanes, King Albert and Queen Elizabeth flew over the Channel from Belgium to England on July 6th on a trip which marked the first time in history that any ruler has ever made a flight from one country to another. The Royal couple traveled in separate seaplanes, each operated by a Belgian army aviator.

On the British side of the Channel the King landed first near a British warship off Dover. The Queen descended soon afterward, her seaplane also landing near a warship. They started from the Belgian coast and made the trip to England in about fifty minutes. The purpose of their visit to England was to attend the silver anniversary of King George and Queen Mary on Saturday.

This is the first time since the war began that King Albert has visited London and virtually the first time since August, 1914, that he has been outside his native land.

Invent New Camera

Allied airmen are using a new multiple camera, a development of the motion picture camera. Thousands of pictures at the rate of one per second can be taken. With a single loading, 750 exposures can be made, and the film for a new exposure is turned automatically. Precision in the mapping of enemy lines is now possible.

Capt. Boyriven Flies Under New York Bridges

French and American aviators celebrated the French national holiday on July 14th with aerial manoeuvres, which would have been much more elaborate but for the rain which fell in the late afternoon. Captain A. J. Boyriven, a French instructor attached to the aviation field at Mineola, opened the day's program with the performance of an aerial feat which had never been performed before—flying under all four of the bridges over the East River in a single flight. He flew with a mechanic in a big, fast machine, an American built de Haviland, equipped with a Liberty motor, and he made the trip at an average of about 140 miles an hour.

Leaving the Mineola field shortly before 8 o'clock he flew across Queens and came out over the East River above the Queensboro Bridge. He flew carefully down along the river, reconnoitering to make sure that there were no boats in the way which might interfere with him as he flew under the bridges, and then turned as he got over Governor's Island, swooped down in a long diagonal and shot under the Brooklyn Bridge about half way between the roadway and the water. As he flew he broke out a French flag beneath his machine, and his mechanic waved a hand at a patrolman standing on the bridge.

The same dash carried the machine on under the Manhattan and Williamsburg Bridges. Then Captain Boyriven rose a little, made a sharp turn following the line of the river, and dropped again and shot under the Queensborough Bridge, rising as he came out and turning back toward Mineola.

An elaborate program had been arranged for the afternoon, including flights and manoeuvres over the city by squadrons of American flyers from the Mineola field, and a flight to Westbury, where a great parade and open-air demonstration was being held by another squadron. Captain Boyriven led a group of American flyers to Long Beach at noon, where they performed evolutions over the boardwalk crowds; and later the same group made a flight, diversified by stunt flying, over Rockaway and Coney Island.

For half an hour or more, shortly after 8 o'clock last night, a dirigible balloon soared about 800 feet above the vicinity of Times Square, displaying from the pilot basket the Tricolor of France.

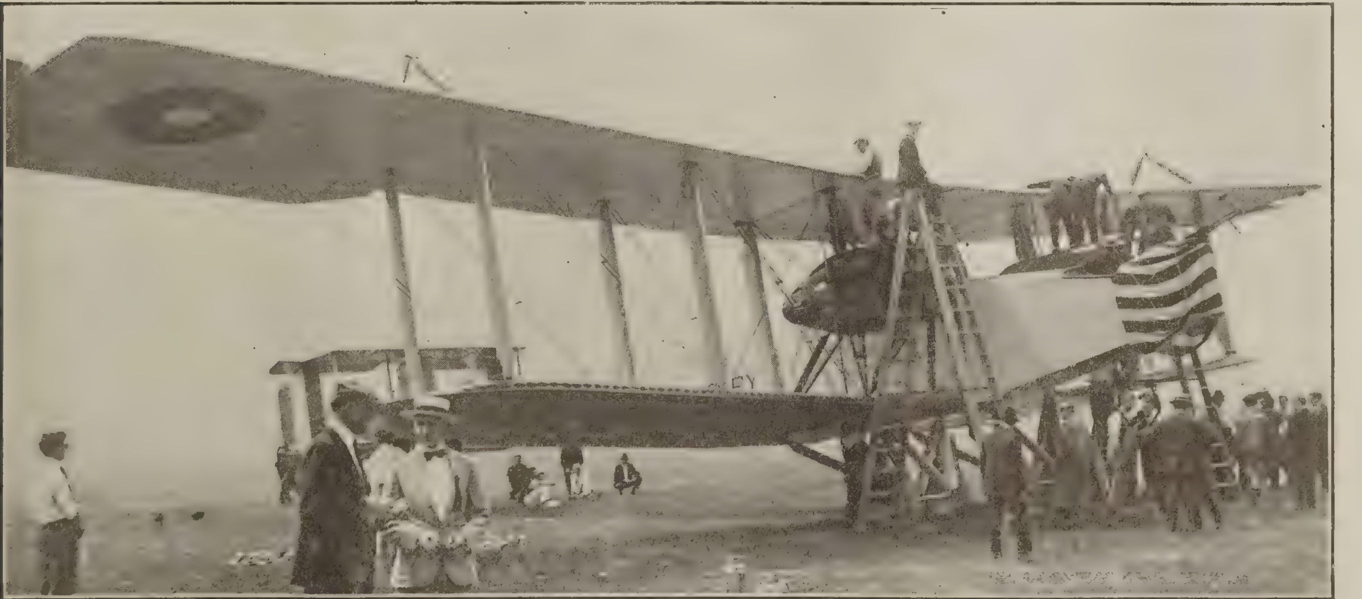
Pigeons Wear Gas Masks

Gas masks are not only worn by human beings, but carrier pigeons are the latest to come under the ban. Even food containers are put through a paraffine bath and hermetically sealed so that they can be carried through the gas zones at the front.

Chicago Aviator Escapes German Prison on Sixth Attempt

London.—Everard Buckley, of Chicago, who was captured by the Germans at Verdun in September, 1915, when he served as an aviator with the French, has at last made good his escape from the German prison camp where he was detained.

He had made five previous unsuccessful at-



The Langley—the American-made Handley-Page bombing machine—which was christened on July 6. Account of the christening appeared in the July 15 issue of Aerial Age

tempts. Buckley has reached Switzerland, according to a Central News dispatch from Schaffhausen.

Uninjured Prisoners

A note dropped by German airmen on the Toul front contains the information that Lieut. G. A. P. Hyler (G. A. Phyler?), Lieut. B. B. Battle of Columbus, Ohio, and Lieut. J. Williamson of California, missing American airmen, are uninjured and held as prisoners.

Meissner of Brooklyn Latest American Ace

Lieut. James Armand Meissner of Brooklyn is the newest American ace. Two additional victories, officially confirmed, won him the honor, making his total now five. Following the bringing down of a German aeroplane last May the Croix de Guerre was awarded him.

Lieut. Goodale, observer, and Lieut. Noyse, pilot, attacked by six German airmen, brought one down and escaped from the others.

5 American Fliers Decorated by King for Work in Italy

A dispatch from Italian army headquarters says:

"The exploits which brought five American airmen decorations cannot yet be published, but the value of their services may be judged from the fact that King Victor Emmanuel traveled to the section held by the Americans to personally make the presentation.

"All the Americans are doing splendid work, more than justifying the confidence placed in them when their presence on the battlefront was requested by the Italian supreme command, and they were selected by Capt. Fiorello La Guardia, the representative from New York, who is now attached to the United States Aviation Corps."

Two American Aviators Killed in France

Paris.—Alan Ash, of Chicago, a member of the Lafayette Flying Squadron, has been killed in a combat with several German machines over Soissons. His machine when falling was seen to burst into flames.

Warren T. Hobbs, of Worcester, Mass., another member of the squadron, was killed on June 26. Forced to fly low because of engine trouble, he was brought down by anti-aircraft guns.

Lieut. James C. Ashengen, of the American Expeditionary Forces, has been interned in Switzerland. He was forced to land in Swiss territory on June 25 because he ran out of gasoline.

Mail Flyer Photographs Aerial Postal Route

Moving pictures were made from the air of the route of the aerial mail men between New York and Philadelphia. Similar pictures will be made of the line from Philadelphia to Washington. The camera man was Lieutenant T. H. Webb, who also flew over the line of the parade in Manhattan on July 4th and trained a moving picture camera on the scene below.

Air Mail Regular Now

On only one day in the last three weeks was it necessary to suspend operation of the aero mail route between Belmont Park and Philadelphia. That was because of bad weather. The southern leg of the route, between Philadelphia and Washington, was operated on that day, however.

Aeroplane mail was carried from Washington to New York on July 10 in two hours and a half, including the stop at Philadelphia.

The average rate of speed for the entire trip was over 90 miles per hour; and that between Philadelphia and New York was 105 miles per hour. Lieut. Dodge left Washington at 11.28 a. m., with 211 pounds of mail, arriving in Philadelphia at 1 p. m., making the distance of 135 miles in 1 hour and 32 minutes. Lieut. Miller left Philadelphia at 1.08 p. m. with 134 pounds of mail, arriving in New York (distance 90 miles) at 1.58 p. m.

The mail from New York arrived at Washington at 3.30 p. m., flying through the storm.

Increasing familiarity of the flyers with conditions attending the flights has resulted in a considerable shortening of the average time. The direction of the compass is compared with the chart every ten minutes during the flight and at each of the larger towns on the route. In this way the route through the air has been accurately charted.

From the Flying Fields

Fort Worth, Tex.—Taliaferro Field at Hicks, twelve miles north of this city, is now the largest as well as the oldest of the schools of aerial gunnery in this country. The Royal Flying Corps started the work on the range last winter and the American air service has greatly enlarged the field and facilities. Leases have just been signed for a tract of 11,700 acres just west of the aerodrome. This is rolling country and will be used as a range. New hangars are being erected and much building is going on all over the post.

Many novel features mark the work of the school. Among them is the Reinburg water target, the invention of Maj. George E. A. Reinburg, the commanding officer. This consists of a basin of water the exact size of a plane which is surrounded by a circle of lime dust. By this clever device shots are easily spotted, direct hits by the splashes of water and close shots by the puffs of white dust. Another interesting device is the cloth tow target, trailing behind a big plane, painted white with black crosses to simulate a German machine.

Carrier Pigeon Training at Chanute Field

The training of carrier pigeons at Chanute Field, near Fort Worth, Texas, which was started a short time ago, is meeting with exceptional success. At the present time there are about seventy-five young birds being trained there. At the beginning of their training they are taken out by motorcycle and turned loose at distances varying from one mile to fifteen miles from their home loft. After this they are taken up in a plane and set loose at quite a long distance from their lofts. So far, none turned loose in this latter way have failed to return, though some of the first flights have shown that all carrier pigeons are not capable of getting back safely.

Sunday Outings Originated by Captain Taylor Are Popular

The most popular recreational feature at Ellington Field, judging from the opinions of the men themselves, is the regular Sunday afternoon outing. This idea was inaugurated by Captain Miller R. Taylor, of the 189th Squadron, who took his men on a fishing trip several weeks ago and enabled the men to have a holiday with little expense to themselves.

Since then, the various squadrons, in groups of two or three, have enjoyed these Sunday excursions. The men are taken in trucks to some lake or seaside resort. Swimming, fishing, boating and baseball are the sports engaged in. The jolly singing of the men on their return trip shows beyond all doubt that they have thoroughly enjoyed the trip.—Ellington Field News.

Gosport System of Flying to be Taught

Lieut. Thomas L. Rouse has been appointed head of the Gosport instructor's school of the Flying Department at Kelly Field, Texas. The principal feature of the new system is that instead of having different instructors at the various stages of flying, a cadet will be under the instruction of one man until he has been developed into an accomplished flier.

Capt. Roy N. Francis, executive officer of the Flying Department, explains the advantage of the Gosport training by stating: "The instructor will be able to familiarize himself with the individual, his peculiarities and his faults, and in this way he will be better able to correct them. He will develop the cadet himself and will turn out a better flier, who will be more rounded out.

Cadets Will Benefit

"Being under the observation of one man, at all times, the cadet will get the benefit of a more personal and intimate touch."

The principal departure from the old system is the installation of speaking tubes by which the instructor in the dual stage can correct the faults of the cadet while in the air. Formerly it was necessary to wait until reaching ground to point out mistakes.

Under the Gosport system, an instructor will have five cadets assigned to him, and these will remain under him until they have learned every angle of flying.

Major McCudden Killed

London.—Major James Byford McCudden was killed accidentally in France on Monday. He shared with Major Bishop the honor of being the most distinguished British flying man. McCudden had won the Victoria Cross, the Distinguished Service Order, the Military Cross and the Military Medal.

Up to April last he had accounted for fifty-four enemy machines, of which forty-two were definitely destroyed, nineteen of them within the British lines.

(Photo © Com. on Public Information)

First all American made battleplane—the Liberty Battleplane—during the christening ceremony in France.. Mrs. Kendall, member of the Aviation Committee of the National Special Aid Society, performed the christening, which was attended by the Allied authorities

Ensign Roe, Naval Air Pilot, Captured

Washington.—Ensign George Roe, of Scituate, Mass., an aviation pilot in the American Navy, has been captured and is imprisoned at Camp Landschut, Germany, the Navy Department was advised on July 5 by Vice-Admiral Sims.

Down Two German Planes

American pursuit planes on July 11th interrupted German observation and photographic work behind the American lines.

Lieutenants Edgar Tobin of San Antonio and Edgar Jones of Chicago attacked a biplane over Flirey (northwest of Toul) at an altitude of 3,000 yards. They dived after him four times, down to 1,000 yards, when he fell over Thiaucourt.

Lieut. Charles T. Merrick of Eldora, Iowa, attacked another biplane north of Flirey. The German went sliding down on his wing, and was reported later by another American flier as having fallen in flames.

Pursuit planes also attacked the enemy's observation balloons, which were hastily pulled down.

Lieut. Quentin Roosevelt, youngest son of former President Roosevelt, brought down his first German aeroplane in a fight north of Chateau-Thierry.

Putnam of Brookline is Foremost U. S. Ace

Paris.—Lieut. David E. Putnam of Brookline, Mass., has formally become the leading American ace in succession to Lieut. Frank Baylies, who has been missing since June 17. Puntam's tenth victory on June 30 now has been verified officially. In June Putnam brought down seven German machines, equalling monthly records made by the late Capt. Guynemer.

Hitchcock, Jr., Made Lieutenant by French

In recognition of his victories over German aviators before he fell within the enemy lines and was made a prisoner, Sergeant Thomas Hitchcock, Jr., has been made a lieutenant in the French service. Word of the promotion was received by his father, Major Thomas Hitchcock, commander of the training department of the Mineola Aviation Field.

The message said the promotion was made by General Petain for "gallant work" performed by the American.

Houston Business Men Buy Instruments for Ellington Field Band

The instruments used by the Ellington Field Band were purchased from funds contributed by a committee of Houston business men.

The committee worked under the auspices of the Rotary Club of Houston, and, with the money that they raised, the finest grade of instruments were purchased.

Ellington Field appreciates the good will and generosity of the men who have made an excellent band equipment possible.

Daniels Commends Two for Rescues

Washington.—Secretary Daniels has commended Lieut. Commander Lewis H.. Maxfield and Lieutenant Frederick P. Culbert, both of the American Naval Aviation Forces abroad, for their part in the rescue of American aviators who were caught in the wreck of a French dirigible balloon in which they were operating.

In a letter to Lieut. Commander Maxfield, Commandant of a naval air station, who was making a flight in the dirigible to inspect the airship and its crew, Secretary Daniels wrote:

"The courage and resource displayed by you after the wreck of the dirigible, particularly in the rescue of two of your men, are worthy of the gallant traditions of the service to which you belong."

Secretary Daniels has made recommendation to the Secretary of the Treasury that a life-saving medal be awarded Lieut. Commander Maxfield.

Lieutenant Culbert was highly commended for the courage and initiative he displayed in aiding in saving the lives of the two men who were in danger of drowning.

U. S. Aviators Destroy Big Berthas

Paris.—American aviators have silenced all the Big Berthas that terrorized Paris, and now the French capital is enjoying peace and calm. For more than a month the longe-range guns have not fired a shot into Paris.

General Pershing's official communiqué of July 13th by the War Department, describes operations in the various sectors occupied by American troops through July 7 to 10. It reads:

"Headquarters American Expeditionary Forces, July 12, 1918.

"Our aviators shot down a hostile machine. It was brought down near Thiaucourt by Lieutenants Jones and Tobin. As a result of their fire the German plane fell in flames."

A Valueless Precaution

Paris.—The idea that paper stuck on glass windows prevented them from being shattered by the explosion of bombs near by has been exposed as valueless by a government scientist who has just completed exhaustive tests.

Parisians, in the belief that the paper protected the glass, had decorated their windows with miles of paper strips, many more or less artistic designs being evolved.

New Curtiss Battleplane Makes Good in Night Test

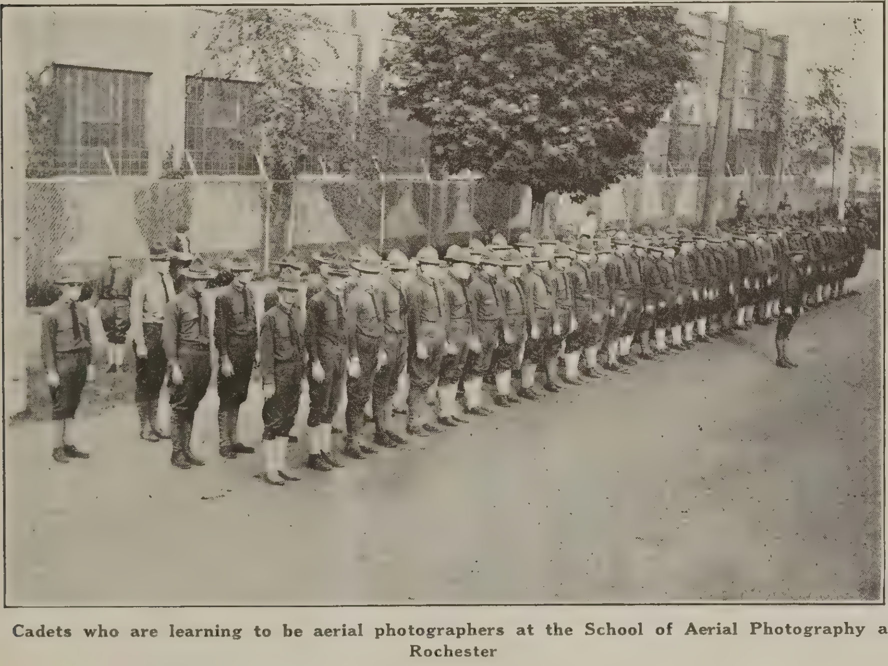
Glenn H. Curtiss and his gasoline engine expert, C. B. Kairkham, recently tested, at the Hempstead Aviation Field, a new battle triplane which developed 150 miles an hour speed and climbing ability of close to 1,000 feet per minute. The triplane carries two passengers and machine guns.

Roland Rolls of Buffalo was the pilot. It is said that both the army and navy will accept the new type of battleplane. Prominent army and navy officers witnessed the initial flight.

More Machine Gun Battalions

Spartanburg, S. C.—Two more anti-aircraft machine gun battalions, to be known as the 4th and 5th Anti-Aircraft Machine Gun Battalions, as are the other anti-aircraft machine gun battalions, are attached to the Provisional Depot for Corps and Army Troops, commanded by Brig.-Gen. Guy Carleton.

The new organizations are in skeleton form, the cadre of the 5th Anti-Aircraft Machine Gun Battalion is being created from men transferred from the casual detachment, Depot for Corps and Army Troops. The officers of the 4th Battalion are: Major Oliver J. Wuane, Capt. David D. Mohler, Capt. Francis F. Painter, Capt. Stephen P. Fuller, First Lieuts. George J. Arendt and Jacob Hauptman, First Lieut. John L. Hurley, Second Lieut. Lloyd J. Arthur and Second Lieut. Lonnie M. Upchurch.



Cadets who are learning to be aerial photographers at the School of Aerial Photography at Rochester

Many Officers Transferred

The officers of the 5th Anti-Aircraft Machine Gun Battalion are: Major George C. Webber, Capt. George L. Caruthers, Capt. Charles R. Willey and Capt. Myron F. Bundy, First Lieuts. Faye G. Prater and Ray Love, First Lieut. John W. Marsh, Second Lieuts. John S. McCleary and Ralph G. Perkins.

Night Flying Important Part of Flier's Training

Ellington Field, Tex.—Future bombing pilots at Ellington Field will have to undergo a strenuous baptism of night flying before they are declared ready for actual service overseas. New courses in advanced night flying have been inaugurated to simulate conditions that the pilot will encounter when he crosses the lines to raid enemy country after dark.

A powerful search light has been stationed to the northeast of the field and each night whips its dazzling path of light to the skies searching out lone ships. It is a game of hide and seek in which the flier is compelled on one night to fly directly into the light and not lose it and on the next night to dodge the blinding tormentor.

Then there will be long cross country flights at midnight which have not been attempted heretofore on any American training fields. After many months of experimentation, officers at this field have rigged up an arrangement for landing flares whereby forced landings will lose their horror.

Radio Squadron to Be Advanced School for Wireless Men

Ellington Field, Tex.—Ellington Field might well be termed the Advanced Field of the United States, judging from the number of advanced schools conducted here. The latest school of this type to be established is the "Advanced School for Radio Operators."

The purpose of this school is to train men who have taken radio school work elsewhere, for actual duty overseas. The course is divided into three sections of one week each and is almost altogether field work. Both French and British systems of working with the artillery will be taught, and the idea is to make conditions as near like battle front conditions as possible. The first two weeks' work will be conducted in dug-outs, just outside of the post, while the third week's work will be in the open, each man being on his own initiative, the work being done with planes. A number of planes will be assigned especially to this work.

Captain Cook, a British officer assigned to duty in this country, has been here, assisting in getting the work started. Lieut. H. B. Lindsay is in charge of the school, Lieut. Fairman is in charge of the instruction, and Lieut. Worrel is in charge of the supplies and maintenance.

Kelly Field to Have Beautiful New Park

Kelly Field, Texas, is to have a park.

The area at the junction of Frio City and Post Headquarters Roads will be graded, covered with grass, and ornamented with flower beds; later in the year shrubs will be used for decoration. A gravel road will be laid from Post Headquarters Road to the road skirting the Supply Depot, and a gravel path will connect the hospital with the Frio City Road.

The American Red Cross will furnish practically all the funds, though all the units benefiting by the improvements will co-operate.

Lieut. Bartlett Breaks Record in Long Flight

Flying from Scott Field, Belleville, Ill., to Payne Field, West Point, Miss., 341 miles, in three hours and five minutes, Lieut. Frank M. Bartlett, Officer in Charge of Flying of Kelly Field, has probably established a new world's record. He covered the 341 miles at an average speed of 110 miles an hour.

The best previous American record for a flight of about the same distance is that made by Lieut. A. Baldioli from Norfolk, Va., to Mineola, L. I., a distance of 330 miles, which he traveled in 2 hours and 55 minutes.

Lieut. Bartlett was favored by a stiff wind, and at times must have traveled at better than 150 miles an hour. The usual time for such a flight is about 5 hours and 49 minutes—that is, a rate of a mile a minute. Lieut. Bartlett nearly cut this time in half.

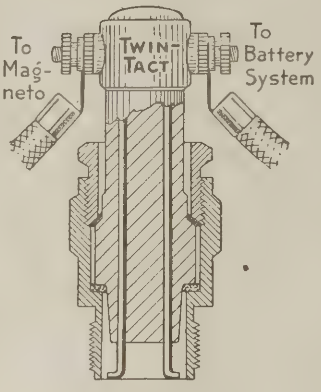
The AIRCRAFT TRADE REVIEW

New Titanine Plant

Titanine, Inc., which was announced as a new $100,000 corporation in a recent issue of AERIAL AGE, has completed the erection and equipment of its plant at Union, New Jersey, and is ready to start production. This company is licensed under the British Aeroplane Varnish Company, owners of all Titanine formulas, which supply about 20 per cent. of the dope used by the Allies. At present thé product of the American corporation will be limited to the manufacture of Titanine dope, and Planoline fireproofing solution, while later it will make pigmented varnishes, identification colors, and spar varnish. Titanine dope has been used in the English and French air service for nearly four years, according to E. G. Davis, General Manager of the new corporation. It is fireproof, at least to the same extent as cellulose acetate dopes, and has the great advantage of containing less than one half of the amount of acetone or acetonic substitutes necessary to make the acetate dope, also the solid materials used are waste products of other industries which, of course, means the minimum amount of outside labor. This, together with the great covering power, makes Titanine one of the most economic dopes on the market. Another feature of Titanine dope is the fact that atmospheric changes have no effect upon it, eliminating the tightening and slackening inconveniences as it keeps the tension of planes constant under all weather conditions. Planoline is a fireproofing solution in the form of a thin first coat dope, which when applied under Titanine makes the fabric as well as the dope fireproof. When Planoline is applied under other dopes it makes the fabric able to resist burning, even if the outer surface dope is fired.

Government May Take Aircraft Plants

Washington.—The Senate Aircraft Investigating Committee, according to rumors here, will recommend that the Government take over all aircraft factories and run them under direct official supervision. Discoveries by the committee in some of the factories visited, it is said, has brought the belief that in no other way can aircraft production be put on a basis which will enable it to catch up reasonably soon with the rest of the army. There are also rumors of profiteering by some of the concerns having aircraft contracts with the Government. The committee's report is expected to be made after Congress returns from the summer recess about August 15th.



Twin-Tact Spark Plug

By the use of the Twin-Tact Spark Plug, an automobile, marine or stationary engine can be fitted with two entirely separate systems of ignition, even though there is provision for only one spark plug in each cylinder.

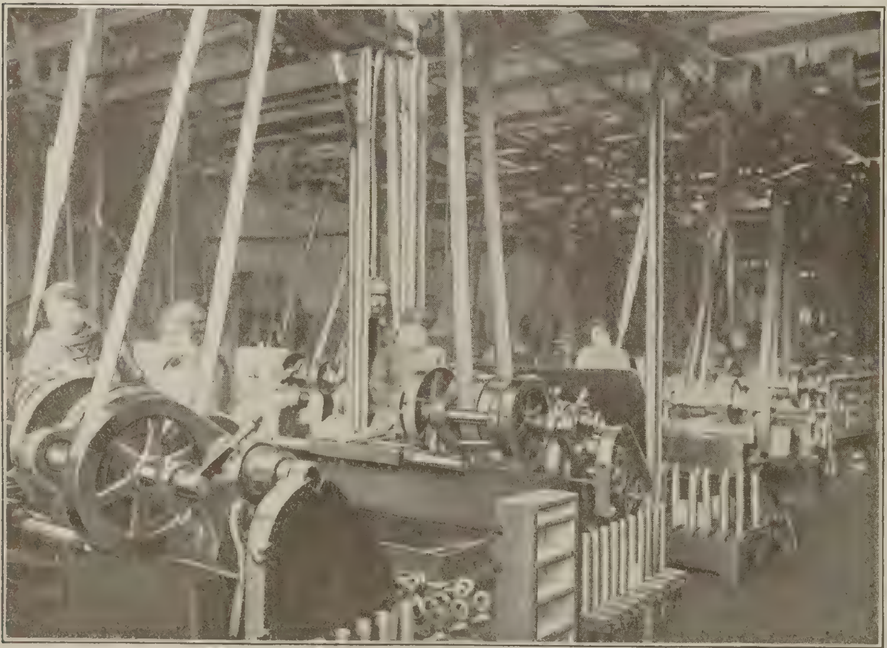
The Twin-Tact Spark Plug is really two plugs in one. It has two separate insulated sparking points, each of which is connected to its own separate insulated terminal post. Therefore, a spark can be obtained from either point.

A magneto may be connected to one terminal post and a battery system to the other, and either system operated independently. Formerly, for separate battery and magneto system, two plugs were required for each cylinder.

Twin-Tact Spark Plugs are manufactured by the Superior Motor Power Company, 135 Fifth Avenue, New York City.

Dividends Declared

The Curtiss Aeroplane & Motor Corp. has declared a regular semi-annual dividend of 3½ per cent on preferred stock, payable July 15 to holders of record July 2.



View of the great French factory of Salmson Engines

Ash Trees for Aeroplanes

The appeal of the Aerial League of the British Empire for ash trees for aeronautical purposes has resulted in between three and four thousand trees being offered, according to *Flight*. The government requirements in the next twelve months are expected to exceed 200,000 trees.

New Material for Aeroplanes

According to a press dispatch from Washington a policy now effective in American aeroplane production is that of supplementing spruce wood supply by using selected timber of other more widely distributed commercial varieties. It is said that exhaustive tests made by the forest service, followed by experiments in construction, have proved that requisite qualifications of strength and lightness for aeroplane building are possessed in varying degree by other woods, notably white pine, and that under orders of John D. Ryan, head of the Aircraft Board, use of them was immediately decided upon.

It is not intended, the technical men say, to displace the invaluable spruce with the other woods except in making the fuselage, finishing the body, the building up sections of the structure like the landing-struts, where the strains and stresses of progress against air resistance do not center. Spruce will still constitute the material for wing spars, struts, between planes, and similar sections where these stresses do center.

Paint and Varnish Makers Asked for Stock Statements

The War Industries Board authorizes the following:

R. S. Hubbard, chief of the paint and pigment section, has sent the following letter to the paint and varnish manufacturers:

"In order to aid in putting into effect the program announced January 21 and March 11 by the Commercial Economy Board, now the Conservation Division of the War Industries Board, all manufacturers are hereby requested to send us an accurate statement as to any stocks on hand July 1 of those items which have been dropped in accordance with its recommendations.

"This statement should be prepared as promptly as possible and include the following:

"1. Complete account of stock of shades or colors, grades, and sizes of packages, which, according to the board's recommendations, will be dropped, and the dates on which these were put up.

"2. Complete account of stock of the unfilled half-gallon cans and smaller sizes which are to be eliminated in accordance with the board's recommendations and the dates when these were manufactured or received."

Women Health Officers for Duty in Munitions Plants

The War Department authorizes the following statement from the Ordnance Department:

Women health officers, whose duty will be to see that the thousands of women workers in munitions plants are kept healthy and their output of war materials thus maintained at the peak of production, are to be trained under the direction of the women's division of the industrial service section of the Army Ordnance Department.

An eight weeks' course of study for a limited number of carefully selected women health officers started Wednesday, June 26, at Mount Holyoke College, South Hadley, Mass. The course is being given under the general direction of Dr. Kristine Mann, health supervisor of the women's branch of the Ordnance Department. The staff of lecturers and instructors includes many well-known specialists in physiology and hygiene, physical education, factory organization, and labor.

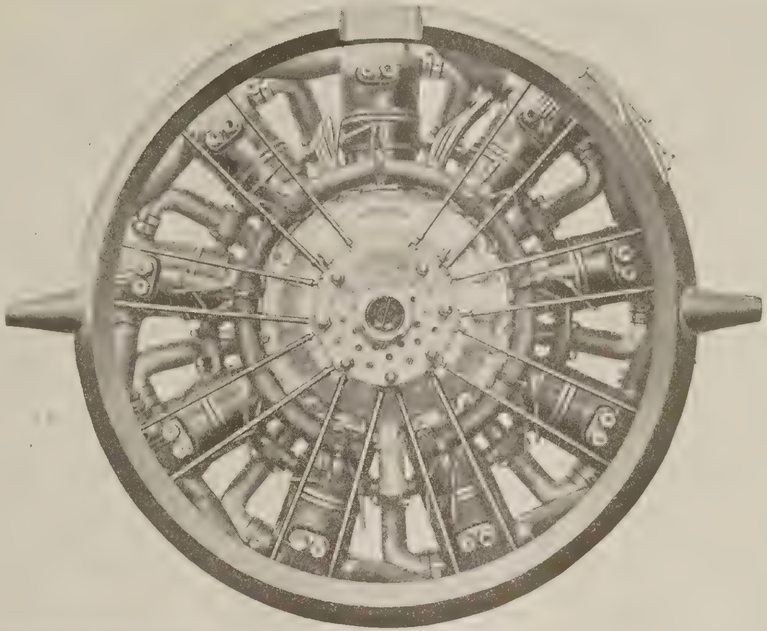
The women who are taking the course are college graduates, or women of equivalent technical education. Almost all have had experience in dealing with working women. The first requirement for admission to the course has been perfect health, and only those have been selected who will inspire wholesome living among the munitions workers.

The work to be done is along entirely new lines. Many of the plants already have physicians and nurses to care for employees when they are ill, but they do not have health experts with a knowledge of the psychology of women workers to do constructive, preventive health work among the women.

Women Do Men's Work Successfully

The unprecedented demands—both military and industrial—upon our country's man power, are fast fulfilling prophecies made at our entry into the war, that when we finally took our place with our allies on a gigantic war basis, women would fill the places of men in our great industrial plants. In the plant of the Goodyear Tire & Rubber Company, at Akron, Ohio, women are now turning out twenty per cent of that company's product.

Many of them are engaged in work that it was thought could not be turned out except by men, yet in actual performance, in much of this work they have actually outdone men. Nearly 3,000 women and girls are now employed in that plant. More than 4,600 men have left the company to enter the federal service—and no factory can lose this number of strong able-bodied men and not miss them. But a thorough trial of women in their places has demonstrated that production will not suffer.



This engine is a product of the great French Salmson Aeroplane engine factory, shown on the preceding page

Two more views of the Springfield Aircraft Factory—one of the latest acquisitions to the American aeronautic industry, who are beginning to contribute substantially to the aeronautical equipment of the American Air Forces

Ryan's Office Moved

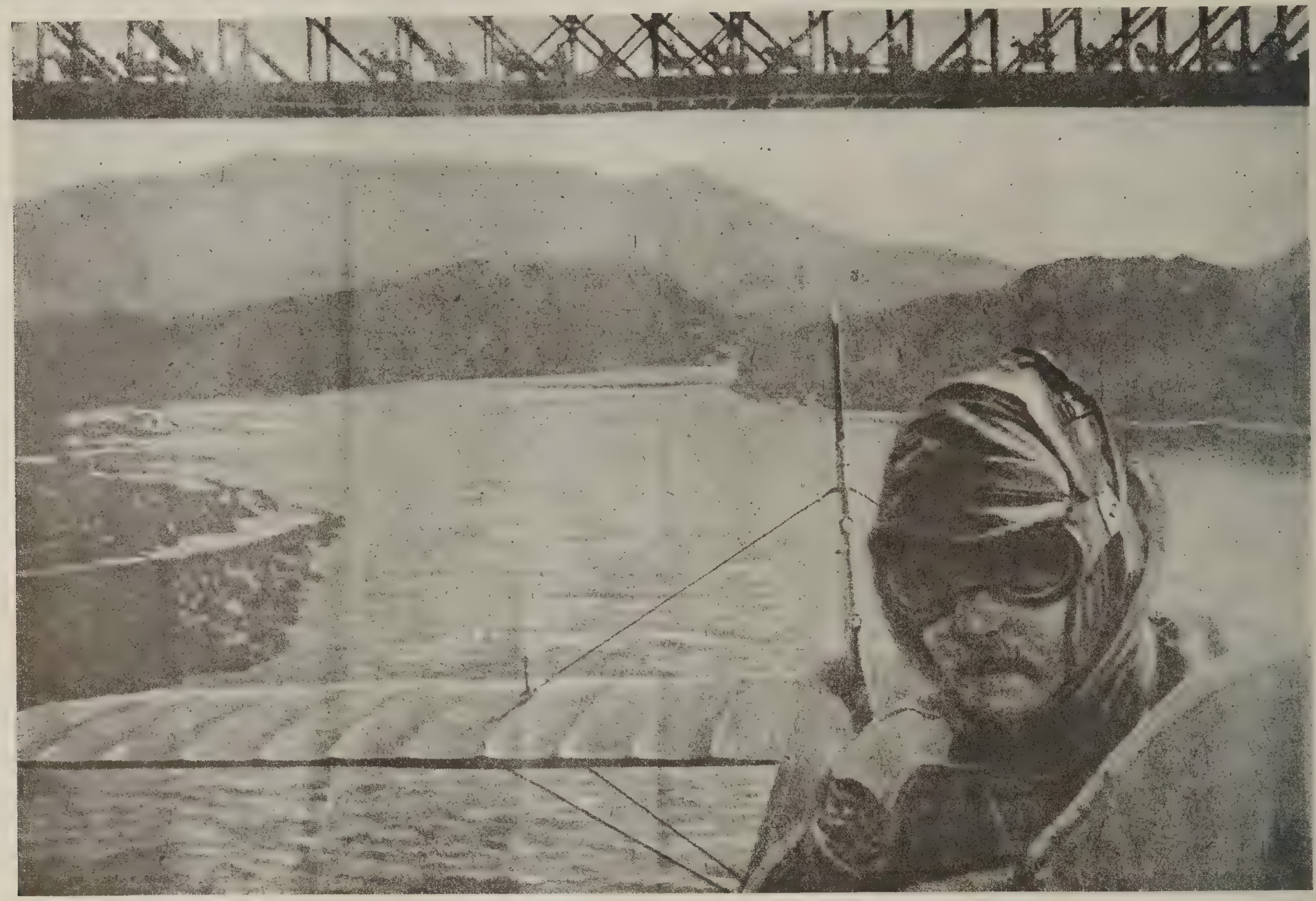
Washington.—The office of John D. Ryan, Director of Aircraft Production and chairman of the Aircraft Board, was moved from the Munsey Building to Wing 8, second floor, Building "D," Fourth Street and Missouri Avenue, N. W.

The Aircraft Board has been assigned offices in the Fourth Street wing of the same building.

Production of Spruce and Douglas Fir

Washington.—According to what are called "preliminary final figures" on 1917 lumber production, just issued by the Forest Service of the U. S. Department of Agriculture, the reported production of Douglas fir last year was 5,327,720 thousand feet. This was 96 per cent of the computed production. The reported production of spruce was 975,913 thousand feet, as against a computed production of 1,125,000 thousand feet. The reported production in this case was only 86 per cent of the computed.

Incidentally it may be mentioned that the total lumber cut for the country for 1917 was approximately 10 per cent less than the production in 1916. This is attributed principally to the largely decreased private building operations, the scarcity of labor in connection with small operations, transportation difficulties, curtailment of demand on the part of wood using industries, and a more or less general dislocation of lumber distribution through ordinary channels of trade. A considerable portion of the total quantity produced was utilized in meeting the exceptional demand for Government construction and other war emergency projects, including ship material.



An Allied Naval Aviator flying under a bridge while on patrol duty. Official photo.

TO ASCERTAIN THE SPEED AND DIRECTION OF AEROPLANES OVER THE WATER

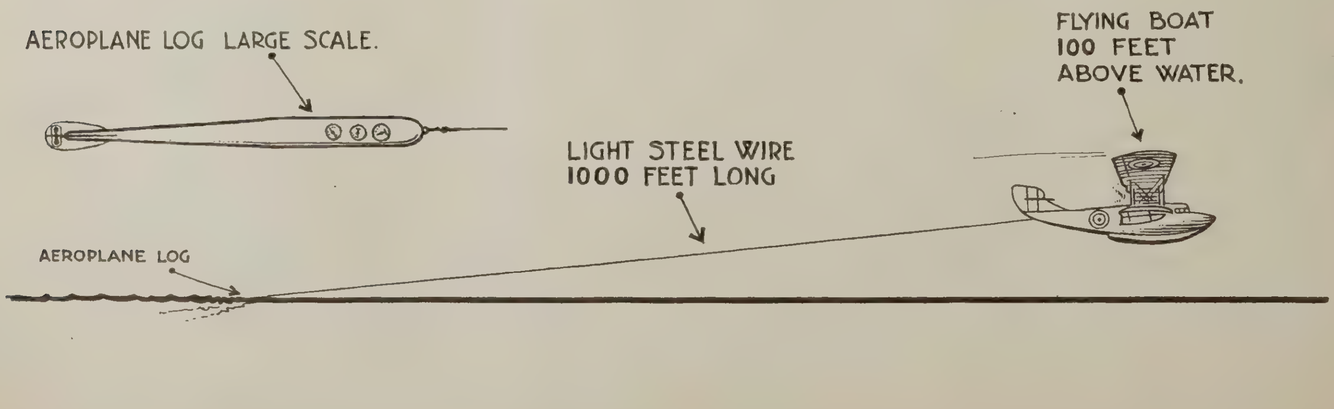
At the present time, the practicability of flight across the ocean, or across long stretches of water, is greatly handicapped by the fact that if an aeroplane is out of sight of land it is practically impossible to tell the direction in which it is moving over the surface of the earth, and its speed in this direction. The speed and direction of movement of a ship over the surface of the earth are determined by methods of precision, which include methods of determining her speed and direction of motion through the water, the speed and direction of ocean currents, and the exact position of the ship by observations of the heavenly bodies.

Admiral Fiske's proposed method, the only plan proposed so far, seems thoroughly practicable to ascertain the speed and the direction of movement of an aeroplane over the water; the method being based on the idea of making an aeroplane follow the same general procedure as a ship does, and thus take full advantage of the science and the art of navigation.

Up to the present moment, little effort has been made to do this. An aeroplane, in starting to fly, usually rises quite rapidly and high, and soon assumes a height at which the science and the art of navigation are extremely difficult of application. Furthermore, little effort is made to maintain straightness of flight; yet, as you know, the first essential in navigating a ship is that it shall steer a straight course; not only in order that precise information may be had as to what that course is, but also in order that the speed may be reduced as little as possible by the resistance which a rudder opposes when it is put to one side or the other.

The first part of his proposition is that, for long flights over water, an aeroplane should be made to steer as straight a course as possible, not only laterally but vertically.

Another part of Admiral Fiske's proposition is that, for long



flights, an aeroplane should fly quite close to the water; not higher, perhaps, than 100 feet above it, in order to save fuel and enable the aviator to get information from the water itself as to the direction and length of flight. Another part of the proposition is to get this information by means of what may be called an "aeroplane log."

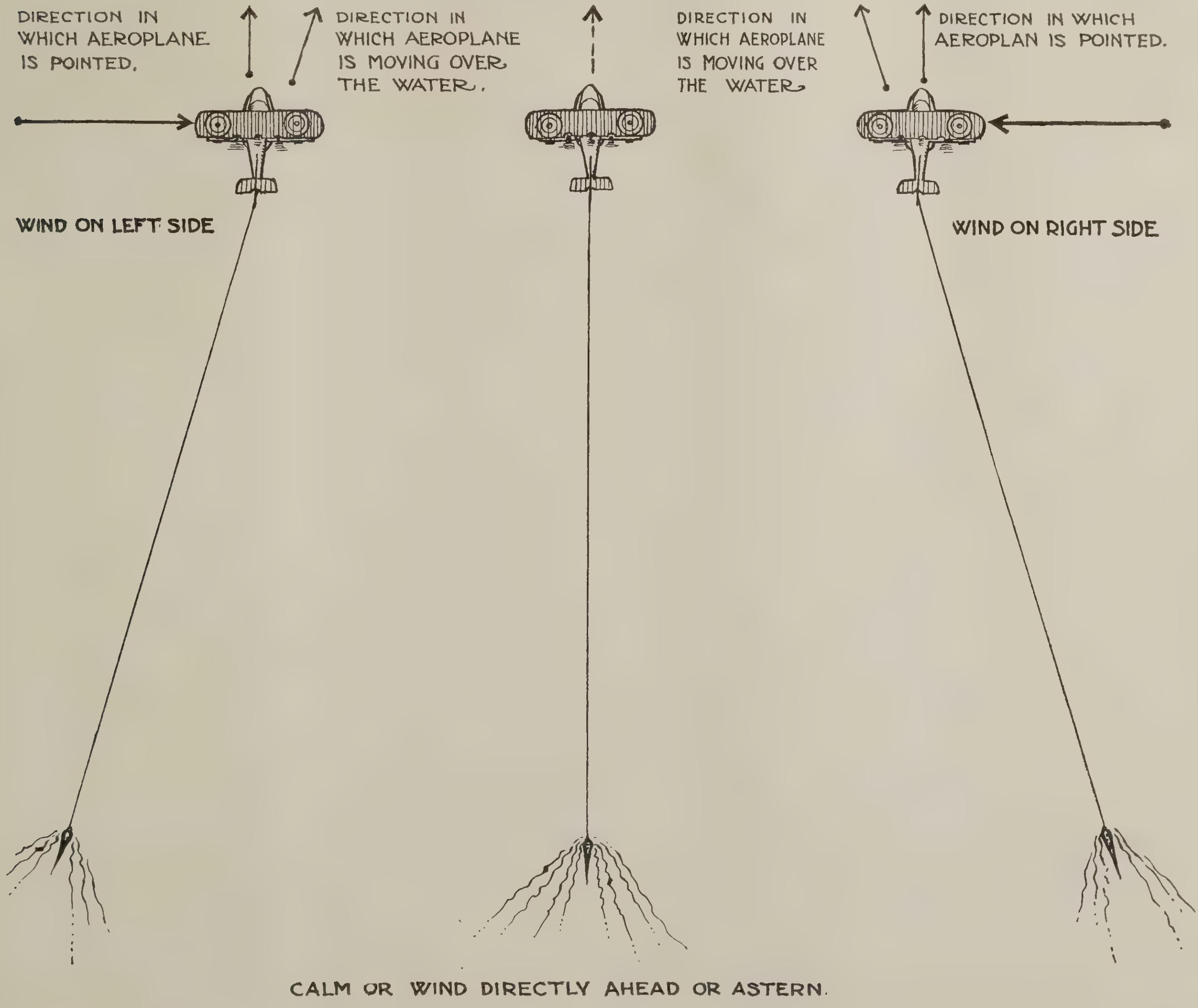
As Admiral Fiske pointed out at the time, the most important information that the aeroplane needs is, not its length of flight, but its direction of flight. This can be ascertained by the simple expedient of towing *through the water* a small object, say a foot long and an inch in diameter, by a long and light steel wire. If the aeroplane is proceeding in a calm, or in a wind which is parallel to the direction in which the aeroplane is pointed, or the reverse, the log will tow directly astern; but if the wind is on either side, the "log" will not tow astern, but will be over on one side or the other; and its direction from the aeroplane will be exactly the reverse of the direction in which the aeroplane is moving over the water. Suppose that you were in an aeroplane going from one port to another, and that your course ought to be north. If you could keep exactly on that course, you would eventually reach your destination, no matter what was your speed (within limits). Suppose, now, that you had out a log such as I have proposed. In this case, no matter what the direction of the wind was, all you would have to do would be to steer the aeroplane continuously in such a direction that the log should bear south from you.

If the aeroplane steers a steady course, your compass will tell you when the log bears south. To make easy the operation of reading the compass direction of the log, the log line may be attached to the end of a pointer that moves under the compass, or under a "dumb compass" that is kept in agreement with the compass.

A little more also can be done; that is, this plan, slightly amplified, can be made to show the length of a flight as well as its direction. To do this, it would be necessary merely to tow what used to be called a "Massey's log." This was a simple contrivance towed by a ship, consisting of a sort of box which was fitted with a propeller that turned around when it was pulled through the water, and thereby actuated dials on the surface of the box. The dials indicated the distance that the box had been towed.

Imagine now that you are in an aeroplane towing a small, torpedo-shaped Massey's log, in which the revolutions of the propeller actuated dials on the body of the log. The direction of this log from you would be the reverse of your direction of flight; and the indications on the dials at any instant would show the actual distance that you had pulled the log through the water. At intervals of, say, an hour, you could haul the log up to the aeroplane and read what it said. In order to pull the log up to the aeroplane, and put it out again, a few minutes would be required, but certainly not more than five minutes. I think that, by noting this time, and applying it as a correction to the indications of the log, you could get the actual distance gone in an hour with only a small error. Suppose that you made an error as great as 2 per cent. In flying a distance of 1,000 miles you would make an error of 20 miles. If you were going 80 miles an hour, this would mean an error of 15 minutes of time in arriving at your destination.

This idea is a good one, and if someone will work it out to a practical success it will make ocean flight a simpler matter in some ways than the navigation of a ship. This is because: first, the time of flight will be so much shorter than that now used up by ships, that much less error will be introduced than ships are subjected to by reason of ocean currents; second, because an aeroplane can go direct from one place to another, and not have to change its course.


DIRECTION IN WHICH AEROPLANE IS POINTED.
DIRECTION IN WHICH AEROPLANE IS MOVING OVER THE WATER.
DIRECTION IN WHICH AEROPLANE IS MOVING OVER THE WATER
DIRECTION IN WHICH AEROPLAN IS POINTED.
WIND ON LEFT SIDE
WIND ON RIGHT SIDE
CALM OR WIND DIRECTLY AHEAD OR ASTERN.

USE OF SOAP FILMS IN SOLVING IMPORTANT TORSIONAL PROBLEMS

By C. A. BRIGGS*

Associate Physicist, Bureau of Standards, Before the Journal Review Meeting of the Bureau of Standards

A GREAT many complicated physical phenomena can be expressed in simple mathematical formulas but what is more often the case many essentially simple physical phenomena can only be expressed with difficulty, or in such form as to limit seriously or nullify the practical applications to problems which it is important to solve. In many cases problems of a certain type can be solved and solved easily when they take restricted forms but when our needs make it necessary to consider other cases we are at once confronted with difficulties that too often render us impotent.

One old problem of this character relates to the stresses and twist produced in a prism of irregular cross-section by couples applied to the ends. When we have to deal with a circular cross-section or a hollow circular cross-section it is a simple matter to determine both the twist that will take place with any particular couple, and the magnitude and disposition of the stresses. When we depart from such a simple shape, however, we at once become involved in difficulties of very formidable character.

The solution of what we call the torsion problem has been a matter of practical importance in engineering problems for many years, and various expedients have been adopted to give us imperfectly what we were unable to obtain from our mathematics. Recently the design of aeroplanes has become of considerable importance, and in which are employed struts, propeller blades, supports, stays, etc., which are subjected to torsion, and in which it is necessary to employ sections of irregular form. The fact that it is of utmost importance to secure the greatest lightness consistent with strength therefore gives the solution of the torsion problem a most peculiar interest. It is, therefore, a rather happy circumstance that just at this time a practical means for solving the torsion problem is presented, which will enable us to obtain all the information necessary and desired in the design of torsion members having cross-sections of whatever character.

The method employed for getting this information has been developed by Messrs. A. A. Griffith and G. I. Taylor, and described by them before the Institution of Mechanical Engineers, and published in *Engineering* for December 21 and 28, 1917.

The principle upon which the method is based is one that was established several years ago, to the effect that the differential equation for the function from which can be derived the solution of the torsion problem, is the same as the differential equation of the curved surface assumed by a uniformly loaded elastic membrane stretched across an opening of the same shape as the cross-section of the torsion member. This relationship holds when the displacement of the membrane is small.

The authors obtained their solution for the torsion problem from measurements made on soap films in a box suitably arranged and convenient for the purpose. A horizontal plate is provided, in which are cut openings corresponding to the cross-sections it is desired to investigate. A soap film is then stretched across the openings and caused to bulge up slightly by producing a difference in air pressure between the two sides of the film. A glass cover for the box containing the film serves to enclose it and prevent evaporation of the film, thereby prolonging its life.

If the surface tension of the soap film were known and the difference in the air pressure between the sides of the film were measured, the facts necessary for the solution of the problem could be obtained from appropriate measurements made on the figure of the film. However, the determination of both the surface tension and difference of pressure are not easily accomplished in practice, and the need is avoided by comparative measurements. In addition to the form of the cross-section to be studied, there is provided in the plate a circular opening which represents the case for which the mathematical solution of the torsion problem is known. The pressure and surface tension is the same for both openings, and the properties of the irregular cross-section are determined by comparing measurements made on its soap film with those obtained from the circular opening.

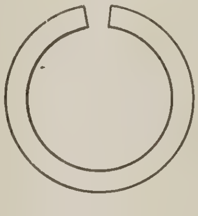


FIGURE 1

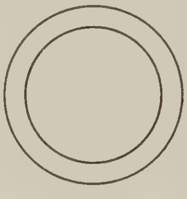


FIGURE 2

The slope of the film at any point is proportional to the shearing stresses set up. An auto-colimating device of simple construction, using light reflected from the film, is used for this measurement.

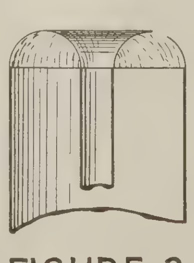


FIGURE 3

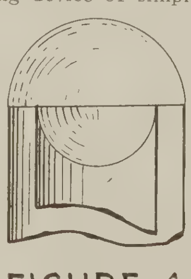


FIGURE 4

The relative stiffness of the member is proportional to the volume contained between the film and horizontal plate. This can be obtained in two ways: first, by budging the films, by displacing the air in the lower compartment of the chamber by introducing a given volume of soap solution; secondly, from the contour lines of the film from which the volume can be obtained by computation. This latter method, while much more complicated, has some advantages.

The contour lines of the soap film are located by means of a point wet with soap solution, carried downwards from a micrometer spindle passing through the sheet of glass covering the top of the box. The position at which the point makes contact with the film can be determined by inspection, and this can be done with very great accuracy.

In addition to giving the volume, the contour lines serve two other purposes: first, each contour line represents a form of cross-section for which the film above it gives the solution for stress, etc. This can be understood from the fact that each contour is the equivalent of an aperture of that form in the plate. At one time, therefore, the solution for several forms of cross-section can be obtained and cataloged; secondly, the contour lines indicate the direction of the shearing stresses. At the surface of the prism there are no shearing forces across the boundary, or surface traction, and this is true for each contour line. Therefore, a torsion member could be segmented along the contour lines without affecting the strength or stiffness of the member, if each part were devised to carry its proper share of the torsion couple.

It is a credit to the authors that they developed their apparatus to the extent that they could carry out in a practical manner the various measurements called for and increase the attractiveness of the method.

From a practical standpoint, the method has many important advantages over a mathematical solution of the problem, if such solution were possible. The method appears to be a very flexible one and for routine work can be adapted to give very prompt results. A feature of very great value is that considerable information can be obtained by merely inspecting the form of the soap film. It is easy to see the effect of inwardly directed angles or curves in increasing the stresses of the cross-section, and improvements in design at once suggest themselves. What is of interest also is that when one becomes accustomed to the forms assumed by films a good mental picture can be formed of what will take place without the aid of the apparatus.

This article has been very well received and has excited an unusual amount of interest and favorable comment. In addition to its practical value, it appeals particularly to the imagination and there are, no doubt, many who are taking an interest in the subject not so much for what is done as for the manner of its doing.

Comments

Solution Applies to Isotropic Materials: What does not appear to be mentioned is that the direct application of the method as given relates only to isotropic substances, while in the construction of aeroplanes wood is used, which is far from being such a material. It may be found desirable, therefore, to modify the method. However, the authors of the papers tried out the method by experiments on a wooden member and found that the twist obtained by a given couple checked very well with that determined by the soap film.

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*Review of a paper by Messrs. A. A. Griffith and G. I. Taylor, in "Engineering," December 21 and 28, 1917.

Ambiguity in Certain Cases: There are certain cases of interest in which a wrong conclusion may be formed, and in which the method may be condemned for what would appear to be an obvious failure of the method. For instance, all of you have twisted in your hands those split brass curtain rods, which can be obtained at any 5 and 10c store. You will also recall that these rods were very easily twisted. The aperture representing this curtain rod is given by figure 1.

You will have no difficulty in imagining a soap film stretched across such an opening. Now let us take the curtain rod and secure its edges together so that they can no longer slide past each other when the rod is twisted, such as by soldering them together at several points. It will then be found that the stiffness of the rod is very greatly increased. Let us now cut out the gap from between the two ends of the soap film aperture so that it will represent the case of the stiffer tube or curtain rod as illustrated in figure 2.

On now examining the film stretched across the opening, we fail absolutely to get any indication of the great increase in stiffness which we found to be the case with our curtain rod. As stated above, the stiffness of the members subjected to torsion is proportional to the volume inclosed by the film. In joining the two ends of the aperture together, we get no very material increase in the volume of the film.

Furthermore, if we now decrease the diameter of the inner boundary until it is small compared with the outer boundary, we obtain a film somewhat as indicated by figure 3.

This figure indicates that the center hole has a very profound effect on the stresses of the cross-section and that the greatest stresses occur at the center, both of which indications we know to be contrary to fact. What then is the difficulty? This is easily explained.

As soon as we cut the gap from between the ends in the outline representing the split ring we have no longer the appropriate film for our purpose. Before we cut the gap we had one continuous boundary, and the torsion problem could be represented by a surface of one sheet. Just as soon as we have joined the two ends together, however, we have two boundaries and the torsion problem must be represented by a surface of two sheets. The case is therefore given by a film arranged as indicated in figure 4.

We have two films, one upwards and one downwards, representing the two sheets required for the solution of the problem. The torsion function is given in this case by the algebraic sum of the ordinates of the two films. We will at once see that the last arrangement of films gives correctly what we know to be the solution for this particular and simple case.

This ambiguity is mentioned for the fact that in going over the scheme mentally, so to speak, I was somewhat upset, after being attracted to the method, to find an apparent failure of it to hold good.

Modifications of the Apparatus

Location of Lines of Constant Shear: The contour lines give the direction of the surfaces across which there exists no shearing stress. However, a shearing stress exists along other directions for each point in every contour, and the value of the shearing stress will in general vary from point to point along the contour lines. What will be of interest, therefore, will be to locate the lines of equal shearing stress in the cross-section.

I have to suggest a simple arrangement, by means of which this can be accomplished. Let us secure a table or stand of suitable construction, mounted to rotate about a vertical axis, and mount upon it a camera directed downwards towards a support for the box containing the soap film. Also let the axis of the lens coincide with the axis of rotation of the table, and let the film be centered substantially with reference to the axis of rotation; and let a light be placed above the soap film at a fairly great distance from it and so mounted that the light can be adjusted to strike the film at any desired angle with the vertical.

From the position of the camera the light will be seen reflected in the film as a pin-point of light. The point from which the light is reflected is determined by the slope of the film at that point. If now the table carrying the camera and soap film be rotated about the vertical axis, the point of light will appear to move around the film, and the plate of the camera will record a horizontal projection of all points of the film having the particular slope for which the light is adjusted. In this manner, by suitably changing the position of the light, all points having the same shearing stresses will be photographed in one figure as a series of lines which can be studied at convenience.

Photographing the Contours: If we take a plate of glass, wet on the lower side with the soap solution, and, holding it in a horizontal position, bring it downwards into contact with the film, the film will make contact with the glass along a contour line. However, the volume conditions have been disturbed, so that the contour corresponds to the undisturbed film at a different height. If now air is withdrawn until the volume of the remaining part of the film is the same as it was before the plate was used, the contour formed by the film meeting the glass is the same as that present at that position before the glass was brought into contact; and the desired contour can be photographed if the appropriate illumination is furnished. By placing the cover plate at a different height and making the necessary changes in volume, any series of contour lines can be mapped out and recorded, either by photographing or by drawing on the plate over the outline of the film.

For the required volume adjustments several different schemes suggest themselves. One method would be always to adjust the bubble formed over the circular opening to a fixed height by the use of suitable points or other indicators. However, in this case it would be necessary to arrange so that the glass plate would not make contact with the reference bubble or interefere with the height indicating devices. Another method would be to have the size of the circular opening such that its reference bubble also would make contact with the plate whenever the other film touched it. The volume of the film could then be adjusted by furnishing several templates corresponding to the contour of the circular bubble, for the various heights at which the plate is to be used and then adjusting the pressure until the area of the contour of the circular bubble was of the correct size as shown by the template for that particular position of the plate.

INDORSE CAPT. LA GUARDIA

Republican Colleagues in Congress Urge Re-election of Aviator

Washington, July 13.—At a meeting today of the New York State Republican delegation in Congress, called by Representative Fairchild, Chairman of the delegation, this resolution was adopted unanimously:

"Whereas, Fiorello H. La Guardia, a Representative in Congress from the Fourteenth District of the State of New York, has been serving his country for several months as an officer in the Aviation Corps in Italy;

"Whereas, by his patriotism in giving his services to his country, and by his splendid work he has been able to do, by reason of the fact that he speaks fluently the Italian language, and also by reason of his position as a Representative in Congress of the United States, in cementing more closely the friendly relations between Italy and this country, and by reason, furthermore, of the valiant service he has rendered since he volunteered, be it unanimously

"Resolved, by his colleagues from the State of New York, that his course entitles him to enthusiastic approval of all Americans, and, in our judgment, entitles him to the loyal support of the constituents he is now representing in his campaign for a return to Congress at the election this Fall."

Flying Field at Anacostia is Named "Bolling Field"

The following order has been issued by Maj. Gen. William L. Kenly, Director of Military Aeronautics:

"The flying field at Anacostia, D. C., is named 'Bolling Field,' in memory of the late Col. Raynal C. Bolling, Signal Corps, who was killed in action on or about March 29, 1918, on the road between Estree and Foukan Court, France, during the German offensive."

The new field, which is now practically completed, will be a single squadron field with a capacity for 18 planes. It will serve three purposes, first as a field for experiments which it is desired be made near Washington; second as the terminal of the New York-Philadelphia-Washington Aerial Mail Service, and third as a training field where administrative officers in Washington may learn to fly, without interfering with their other duties.

Col. Bolling, for whom the field was named, was sent overseas on July 16, 1917, as head of America's first Aviation Mission to the Allied Governments.

Col. Bolling was born in Hot Springs, Ark., September 1, 1877, graduated from Harvard College in 1900, and rose rapidly through the legal profession to the position of general solicitor of the United States Steel Corporation. In August, 1915, he organized and took to the training camp at Plattsburg an experimental motor machine gun battery of 70 officers and men, and in the spring of 1915, as a first lieutenant in the Signal Corps of the National Guard of New York, organized the first aero company of the guard in the United States. He passed his reserve military aviators test in the following September, and on March 14, when war with Germany appeared inevitable, was recommended for a commission as major in the Signal Corps. He was assigned to active duty on May 10, and on June 9 ordered overseas as special representative of the Aircraft Production Board.

U. S. Airmen Honored

Italian Army Headquarters.—Five American aviators attached to the Italian army were decorated with the Italian War Cross on July 4th by King Victor Emmanuel at a review in the presence of Gen. Eben Swift, head of the American military mission.

They were Lieuts. Archibald Frost, John Park, Raymond Baldwin, Kenneth Collins and John Galchoux. The crosses were given for carrying out the greatest number of bombing raids during the recent Austrian offensive.

THE LATERAL DIHEDRAL

By JOHN G. HANNA

THE recent discussion of this subject in these columns by Mr. William R. D. Shaw, the English aviator, proved of much interest to the present writer, who has, during eight years of designing, been a consistent advocate of the use of the dihedral. In the early days no subject was more argued over and thrashed out. More recently other questions of design have come into prominence and the dihedral has been overshadowed. But perhaps a simple presentation of the elementary principles of the subject will be of interest at this time to the thousands of newcomers in the industry whose acquaintance with it does not antedate the war.

Mr. Shaw's article will furnish about as good a text as any other for this discussion, and it should be understood that references to his remarks are by way of illustration only, and are not made in any spirit of controversial criticism.

It is rather drastic to say, as he does, that nine English text-books out of ten give an erroneous explanation of this principle. But to say that "the stabilizing principle is derived from the change in the projected plan area of the wings of an aeroplane as the latter rotates about its horizontal longitudinal axis" is to put the matter, if not incorrectly, at least obscurely and inadequately. A much clearer analysis of the forces is possible.

Let Fig. 1 represent an aeroplane in horizontal flight. For simplicity in the drawing a monoplane with the wings meeting at the center of gravity is indicated. Let the arrows A and A^1 represent the lift on each wing, acting at its center of pressure. These forces will have components N and N^1 normal to the wing and tending to rotate the machine about its center of gravity. Being equal while the machine is level, they neutralize each other, and no rotation occurs. Now suppose the machine to tilt as indicated in Fig. 2, all other conditions remaining constant. It is seen that the normal component N is greatly increased, while the normal component N^1 is decreased. Thus their algebraic sum results in a turning moment about the center of gravity which rights the machine. But it may be shown by the principles of similar triangles that the ratio of N to N^1 is equal to the ratio of R to L, these latter representing the projected plan area of the wings. Hence it may be said that the text-books Mr. Shaw condemned were right, to a certain extent. There is another way of looking at the matter, namely, to consider only the forces A and A^1 and note that when the machine is tilted A acts through a virtual lever arm X which is longer than the virtual lever arm Y of A^1, and thus a righting force results. The ratio of X to Y is also equal to the ratio of R to L.

That is about all that can be said for the projected-area theory, and even when explained to the fullest extent possible it still leaves some unsatisfactory points. There is a better and more logical method of considering the forces acting on a dihedral plane, and this method will now be discussed.

Taking Fig. 3 to represent the same aeroplane as Fig. 1 and under the same conditions, the normal pressures on the wings, considered as concentrated at the center of pressure on the wing, would if prolonged meet in a point P above the wings. (In reality, the pressure forces below the wing and the depression forces above will have separate meeting points, and any slight inequality in pressure or pressure distribution will affect the location of the points; so that the quantitative determination of P is as difficult a problem as ever delighted a mathematical shark. These considerations, however, do not invalidate the qualitative exposition of the theory.) The effect of the forces N and N^1 is here equivalent to that of the single upward force L, acting directly above the downward force W, the weight of the machine, and resulting in perfect balance.

Now when the machine tilts, as shown in Fig. 4, the point P is displaced to one side, and as a result several different actions take place. The vertical component of L is no longer equal to W. As the resultant of L and W, the machine moves outward and downward in the direction of the arrow S. This results in a wind force on the lower wing K. V and K tend to move the point P back to its original position, while at the same time W is moving toward the present vertical plane containing P. Equilibrium is restored when L and W are once more in the same vertical line.

In practice, when L and W move to re-establish their coincidence, they both overshoot the mark, and the reverse movement takes place, resulting in the well-known "rolling" action. The amount of side-slip that takes place before L and W are again in line is proportional to the dihedral angle. That is to say, a plane with a dihedral of 175 degrees would have to slip much farther than one of 160 degrees; for in the latter case the height of P, and consequently the separation of L and W laterally, would be much less.

This method of considering the forces may be applied to any dihedral, whether positive, negative, or zero, and its explanation of stability holds good in any case. Fig. 5 shows an aeroplane with a negative dihedral. In this case the normal forces on the wings meet in a point *below* the machine. Their equivalent is an upward force L equal to and balancing W. It will be seen that the machine is practically a pyramid balanced on its apex, so far as stability goes. When the machine tilts as illustrated at Fig. 6, unbalanced forces instantly act to tilt it still farther, and in this the wind pressure K helps.

The only possible method of keeping upright a machine with a negative dihedral is to use a very low center of gravity. It is significant that the few natural examples of a negative dihedral in flight are all so arranged. Fig. 7 shows the typical wing and body position of the pelican. But this bird is by no means a stable glider in anything but uniform air conditions, and in gusts has to resort frequently to wing-flapping to restore equilibrium. Fig. 8 shows the typical wing and body outline of the common buzzard, one of the most perfect soaring flyers. In a gale these birds certainly do roll, but they remain calmly stiff-winged and never lose their balance.

It has been proposed to use a wing in the form of a segment of a circle, as illustrated at Fig. 9. This would have many of the good points of the dihedral. An excessive side-slip with such a wing would be almost impossible. But it involves some sacrifices of lift, and structurally it would be almost impossible on small machines. The big Handley-Page shows somewhat this appearance in its photographs, and is known to be a very stable machine. Another solution of the side-slip is shown at Fig. 10. This is structurally entirely practicable, and the upturned wing-tips effectively check side-slips. It lacks the dynamic stability of the dihedral and of the circular shape, and has no rolling action. The objection to it is that the upturned tips are largely parasite resistance, as they contribute little to the lift.

It is interesting to apply the foregoing method of force analysis to the plane with zero dihedral, though the condition cannot be represented in a drawing. In this case the forces N act vertically, are parallel, and consequently their meeting point P is at infinity. A small tilt will displace P an infinite distance to one side, and no amount of side-slip can bring L and W into line again. Consequently L must be brought back above W by turning the wings back to level through the aileron control. Hence the straight wing has no dynamic stability—its rotation brings no corrective forces into play.

In viewing the drawing of Fig. 3 the thoughtless observer is likely to conclude at once that it represents in effect a pendulum. And even aviators of long experience and men who have designed successful machines persist in speaking of pendulum action and in thinking the dihedral-winged machine acts on the pendulum principle. Such is not the case, however, any more than the rolling of a ship is pendulum action. The Point P has some analogy with the metacentric point in the stability diagram of a ship, though the correspondence is not exact. It is a pity that all aeronautical engineers cannot be compelled to study first the principles of ship stability as expressed in marine engineering. For while, of course, there is no direct equivalent whatever between ships floating in water and aeroplanes dynamically supported in air, and while few marine engineering principles are directly applicable to aeroplane design, yet this study would result in a far better understanding of what *safe* stability really means; it would save oceans of twaddle that are written and spoken about aeroplane stability; and it would avoid some designs whose building is a waste of money and whose failure often involves a waste of life.

So far, in considering the stability of the dihedral, no account has been taken of the position of the center of gravity of the machine with relation to the wings. This position has an important modifying effect, or rather several effects. Let us see what they are.

Fig. 11 illustrates the three possible positions; with the center of gravity at the apex of the dihedral, with the c.g. below this apex, and with the c.g. above this apex. It is readily seen that in the second case the righting force acts through the longest virtual lever arm L', and in third case through the shortest lever arm L''. Consequently the righting force is increased by a low c.g. and diminished by a high c.g. Those who proclaim the latter fact as a virtue should remember that the righting force can also be diminished to any extent desired, and more easily and safely, by the simple expedient of flattening the dihedral.

These various positions of the center of gravity have their characteristic effects in banking. The c.g. must be considered in this connection relatively to the center of lateral resistance. A very simple illustration of the forces involved is given in Fig. 12. If a ball suspended on a cord is set moving in a circular path, it will swing outward to such an extent that the resultant of the tension in the cord and the pull of gravity just balance centrifugal force. For any given mass, velocity, and radius of the circular path, there is a definite angle of the cord which will exactly balance all forces, just as for any aeroplane at a given velocity and radius of turn there is a natural banking angle which will result in perfect balance. If a centripetal force is applied to the cord sustaining the ball, the axis of the latter will assume a greater inward inclination; while if such force is applied below the ball, as for instance, against a pin projecting from its axis, this axis will assume a lesser inward inclination, or none, or even an outward inclination.

Such effects are precisely those that take place with a turning aeroplane. The machine with a low center of gravity tends to turn inward too far, and risks an inward side-slip. It has been shown, however, that this type is also the one with the strongest corrective power over side-slipping and the one least in danger from it. The machine with a high center of gravity tends to bank too little, and risks an outward skid or slippage which may develop into an outward and downward slip. In the latter case its position is critical, for this type has the least natural power of correcting its side-slips.

In a case where the center of gravity is actually so high as to come above the center of lateral resistance, the machine of itself cannot bank inward at all, but will tend to turn over outwardly unless forced to bank by use of the ailerons. For it is then in the position of the third illustration of the swinging ball just given. Inasmuch as the center of lateral pressure on the wing is not far from the center of supporting pressure, and when other lateral surfaces are considered, the net center of the entire lateral forces may be at or below the center of support, it seems a very radical statement to say "if the principle of the lateral dihedral is correctly applied the center of gravity should be above the center of support"—a very radical statement indeed, to put it mildly. It will be difficult and perhaps impossible to prove that statement, either in theory or in practice. So far it has never been proved, and certainly not by the Fokker monoplane.

This machine was cited by Mr. Shaw as proof of the statement above quoted. While a scale drawing of it is not at hand, it is the writer's recollection that its proportions were substantially as indicated at Fig. 13, and that its center of gravity was very slightly below, or perhaps coincident with, *but not above,* its center of support. It is true that it showed excellent lateral stability, but that is about all that can be said for it. Structurally it was a crime: the old three-wheel Curtiss was no worse. Today we recognize that landing stability is really more important than stability in the air. Who among our most audacious pilots would care to bring this Fokker to ground at 50 miles an hour on the rough surface of a hastily improvised aerodrome at the front, or who would risk a *vrille* with its poorly braced wings?

In behalf of the brotherhood of designers, a plea might be addressed to the brotherhood of flyers, who often wonder why the men at the drafting board do not incorporate such and such improvements. The answer is that, while we know very many ways in which an aeroplane

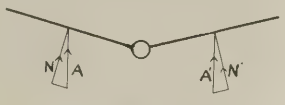


Fig.1

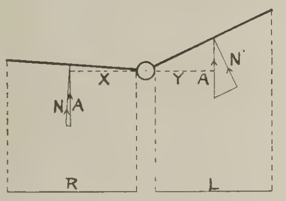


Fig.2

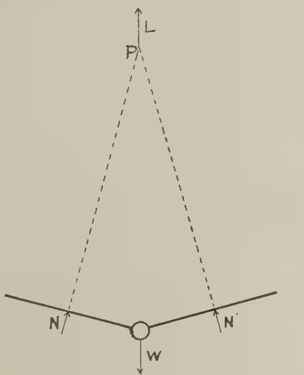


Fig.3

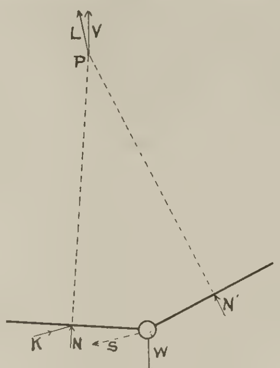


Fig.4

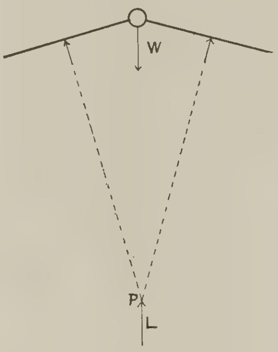


Fig.5

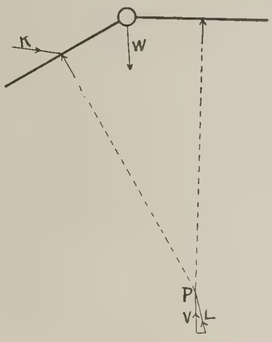


Fig.6

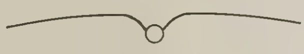


Fig.7

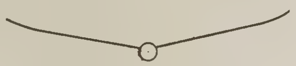


Fig.8

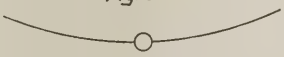


Fig. 9

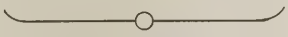


Fig.10

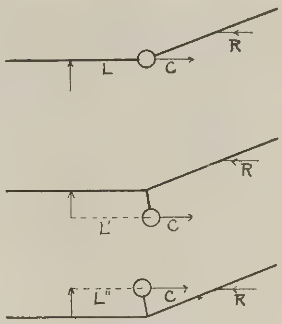


Fig.11

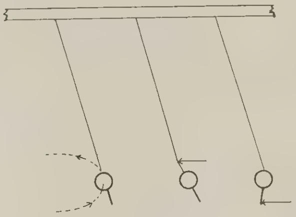


Fig.12

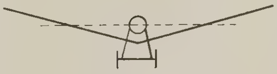


Fig.13

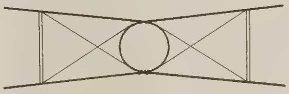


Fig.14

might be improved aerodynamically, the limitations of the principles of mechanics and the properties of materials so far prevent us from using this knowledge. We know, for instance, that the elimination of wire bracing from the wings will greatly improve speed. But if this elimination means such an abortion as the present wireless Fokker triplane—well, let Herr Fokker do it.

For the machine with a high center of gravity it is argued that in case of engine stoppage the aeroplane assumes a natural gliding angle. Sometimes it does; and sometimes it assumes a natural vertical nose diving angle, from which only a very expert pilot can extricate it, perhaps by a loop. Such a statement as the following cannot be passed by: "Of course, longitudinally it may be advisable to employ a rather larger tail with the high center of gravity; this is a moot point." In the humble opinion of the writer, this is not a moot point. It partakes of all the elements of absolute certainty. Besides a larger tail, he would suggest for such a machine a larger rudder; larger ailerons; larger shock absorbers; a larger safety belt; a large parachute for use in case the pilot had to abandon a machine hopelessly beyond control; and a large life insurance policy in case the parachute failed to work.

It seems rather futile to argue that a high center of gravity lessens or neutralizes the righting power of the dihedral. True, but why go to much pains to make a structure that will have certain properties and then go to still further pains to add a modification that will destroy all these laboriously acquired properties? Most certainly, by locating the center of gravity in line with the center of lateral pressure, the banking of the machine on a turn can be made a matter of delicately exact balance —under normal conditions. But abnormal conditions, ever present in the air, can destroy an exact balance at any moment. It is the consensus of opinion among designers today that it is best not to strive for an exact balance of this nature; it is best to approach the theoretical ideal, but to keep far enough away from it to assure a good margin of safety under practical conditions.

The search—now perhaps twenty years old—for a dihedral construction that will have a strong righting force, but at the same time will not rock or roll, belongs in a class with the search for the philosopher's stone and for perpetual motion. It is one of the classic delusions of the ages. For it is a universal law with countless manifestations that whenever a natural force acts to restore disturbed equilibrium, a diminishing and vanishing oscillation is the accompaniment. So great is the law that it transcends the realm of physics and has its instances in psychology. It is not clear why this diminishing oscillation, which is small in a well designed machine, should be considered an evil. It cannot become an increasing oscillation unless a nervous pilot misuses his lateral control in trying to check it. The damping effect of the wings is a powerful check on oscillation, and incidentally is greatest with a low center of gravity and least with a high center of gravity.

A certain poorly informed seeker after the non-rolling dihedral once advanced the very slight rolling of the great Atlantic passenger liners as proof that non-rolling forms can be developed. But the truth is that these ships have not the most safely stable forms that naval architects can design—far, very far, from it. Their motion is slight because their huge mass, in combination with their speed, develops an enormous number of foot-pounds of energy against which the impact of disturbing waves is comparatively feeble and ineffective; precisely as the 200 H. P. Spad fighter can ride a gale easily, thought it has little stability of form, because its great speed, in combination with its mass, develops an enormous number of foot-pounds of energy against which the impact of disturbing gusts is comparatively feeble and ineffective. In the writer's opinion, it is in this direction that the ultimate settlement of the problem of lateral stability lies; namely, a moderately stable form, in combination with sufficient mass and speed to smash through all opposition with little difficulty, and, for the exceptional conditions, good lateral controls and a good pilot to handle them. No one can say what will be done in the years of infinite possibilities before us; but some basic principles are by now established with sufficient firmness to make it safe to say what will *not* be done. And it is reasonably certain that the safe machine of the future will not be any such freak design as the early Fokker monoplane, or for another instance the Dunne—both perfect as to their theory but structurally not to be tolerated, and with aerodynamic defects that outweigh their aerodynamic advantages.

As regards the application of the dihedral to the special case of the tractor biplane, many will agree with Mr. Shaw that the machine with dihedral on the lower plane only is a very desirable type. It has performed well, and has, as he says, many points to recommend it. One objection is the reduction of the gap, and consequently efficiency, towards the wing tips. But it may safely be said that the tractor biplane with equal dihedral on both wings will always be seen, and perhaps will be the favorite type, as long as men navigate the air.

What is said by Mr. Shaw as to the bad effect of an inclined virtual axis of inertia on the stability of the positive dihedral is very true. Conversely, such an inclined axis may give the negative dihedral some approach to stability, though it is hardly correct to honor that wretched conception, the negative dihedral, with any even greatly qualified use of the word "stable." It seems to be the consensus of opinion among designers that the inclined virtual axis of inertia is bad in any case and with any modifications, and any considerable inclination must be avoided.

After the many references that have been made herein to Mr. Shaw's article, a comment on his closing sentence, though it does not concern this special subject, is only just. "As an aviator, of course, the writer is not too well acquainted with the methods of designers of high class aeroplanes, but he hopes they will find the points raised worthy of their consideration." He may feel assured that designers of good machines do find the views of practical, thoughtful flyers not only worthy of consideration, but always welcome and often valuable. The other kind of designer, self-sufficient in his own narrow little field of book theory, will pass away. Better co-operation will save the building of such types as that indicated at Fig. 14, whose dazzling wing arrangement proceeded from the brain of a designer who, on the one hand, had not flown 18,000 miles, and on the other, had not devoted ten years to the study of the properties and possibilities of the dihedral—perhaps not even ten minutes.

It would be well if we could have more frequent expression of the views of the aviators on points of design. For it's a big job before us, this conquest of the air—the biggest man ever tackled. It isn't a one-man or a one-class job. In the struggle toward ultimate perfection there is work for the designer, the aviator, the builder—for every last and least man connected with the industry—work enough and glory enough for all.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
ALF—Report to Camp Alfred Vail; Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Dallas, Tex.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School fòr Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Aviation General Supply depot, Middletown, Pa.

Note 3—Report to Radio School, Austin, Texas.

Note 4—Report to Capt. M. H. Grace, Grand Central Palace, 46th St. and Lexington Ave., New York

Note 5—Report to District Manager of Prodution, 480 Lexington Ave., New York.

Note 6—Report to Union Switch and Signal Co., Swissville, Pa.

Note 7—Report to Expeditionary Depot, Baltimore, Md.

Note 8—Report to S. C. Recruit Depot, Fort Wayne, Mich.

Note 9—Report to Army Balloon School, Leehall, Va.

Note 10—Report to Bustleton, Philadelphia, Pa., Officer i/c Aerial Mail Service, operations section.

Note 11—Report to Approvals Officer, National Cash Register Co., Dayton, Ohio.

Note 12—Report to Commanding General Southeastern Dept., Charleston, S. C.

Note 13—Report to Army Balloon School, Arcadia, Cal.

Note 14—Report to S. C. Aviation Mechanics School, St. Paul, Minn.

Note 15—Report to Aviation general Supply Depot, Chicago, Ill.

Note 16—Report to Silvex Co., South Bethlehem, Pa.

Note 17—Report to Commanding General, Governor's Island, New York.

Special Orders No. 147-152, Inclusive

A	
Ainsworth, Cyril	TFT
Armanstrout, Guy E.	FOB
Ames, Adelbert	DAP
Allen, George B.	FRF; TFT
Apgar, Frank F.	LDT
Adams, William A., Jr.	MAT
Altman, Harry L.	AFO
Ashe, Harry P.	MAT
Arnold, Ivan T.	PMT
Alling, Kenneth S.	FRF
Armstrong, Walter	AFO
Ayars, Milbert P.	DIK
Aven, William R., Jr.	FRF
Armstrong, Max V.	DIK
Arnold, George M.	FRF
Adams, Henry P.	DMA
Austin, Eugene H.	WFO
Ayer, Carleton S.	EOT
Anderson, Anthony A.	WFO
Armstrong, Ralph S.	TFT
Arnold, Wellington	Note 3
B	
Bartholomae, William A., Jr.	FRF
Baetjer, Charles H.	DMA
Beattie, Theodore L.	TFT
Bird, Emerson P.	FRF
Bazley, Halsey R.	DIK
Blunk, Adolph	FRF
Baird, Andrew	FRF
Bostwick, William H.	LHV
Barksdale, James B.	PWM
Baker, Solomon F.	FRF; TFT
Beeks, Herbert S.	FRF; TFT
Benton, George A., Jr.	FRF; TFT
Brackett, Edward T.	FRF; TFT
Butler, Clyde H.	FRF; TFT
Boulton, Howard	DMA
Butts, John W.	DMA
Benner, Wesley	CGC
Berg, Carl L.	FRF
Bailey, John Madison	SLR; FOB
Bridge, Robert B.	CGC
Budd, Denison M.	FRF
Baldwin, Marion A.	FOB
Bond, Wilmer K.	DIK
Bush, Bradford S.	KST
Brennan, John Patrick	SLR; KST
Barler, Richard C.	FRF
Beam, Rosenham	FRF
Beiseker, Charles E.	DIK
Besse, Gerard C.	FOB
Burns, John Vernon	SLR; HHN
Baron, Leo A.	FRF
Babcock, Henry Stoddard	SLR; CAF
Borden, John A.	AFO
Barnett, Robert Marrs	DIK
Bagley, Henry S.	AFO
Bach, Albert	FRF
Bash, Henry E.	FRF
Blanche, Eugene H.	FRF
Booze, Ralph W.	FRF
Brown, Wayland H.	FRF
Butner, John Calvin, Jr.	DIK
Beck, William M.	MAT
Brennan, James D.	AFO
Bevan, William A.	MAT
Bower, Raymond G.	SBI

Brew, Paul	FRF
Boyd, George W	BST
Baskett, Edgar S	EOT
Bunn, Charles	FRF
Bacon, Benjamin S	SMM
Brush, Oliver G	SMM
Breeze, Clinton S	SMM
Brown, Wallace A	DIK
Boothe, William H	PFO
Bergman, Arthur J	FRF
Bryan, Louis C	FRF
Bean, Herbert S	FRF
Behel, Vermon W	EOT
Blackburn, Border	FRF
Behr, Kenneth P	LHV
Bothwell, Roy Clayton	SLR; PFO
Bastow, Joseph G	TFT
Backus, Clinton J	FRF
Burns, John V	DIK
Bond, Wilmer K	FRF
Bramhall, Maynard	TFT
Belsky, Charles J	FRF
Burrows, Frank H	PFO
Braun, Milton F	DIK
Blake, Frederick H	WFO
Brizzolara, Robert Thomas	SLR; PMT
Boggs, Stanhope S	DIK
Baisley, Herbert K	TFT
Bakala, Chester Chandler	DIK
Bullitt, Joshua F	BST
Brooks, Frederick A	PMT
Breakstone, Isadore Lawrence	SLR; GLC
Bullard, Edward L	PFO
Borden, Joseph L	LHV
Benjamin, Hamilton F	Note 17
Beveridge, John, Jr	Note 14
Butler, William H., Jr	Note 2
Blanton, Walter K	Note 2

C

Cox, Sull R	VBW
Cook, Phillip P	DMA
Cowen, Edward G	FRF
Coleman, Robert H	DIK
Cumbus, John W	DIK; FRF
Cottrell, Clifton C	TFT
Clark, Gordon W	DIK
Campbell, Theodorick P	FRF; DIK
Christian, Savias T	FRF
Clinton, Ambrose Victor	SLR; FOB
Collins, Raymond B	FRF
Churchill, Walter A	PFO
Clark, John E	DIK
Caldwell, Frederick W	TFT
Cooper, Walter W	FRF
Crawford, Alan	FRF
Cole, Melverne C	FRF
Cameron, Burr S	SBI
Campbell, Don M	SBI
Caldwell, Frederick W	FRF
Caswell, Clyde C	FRF
Cowgill, John R	CGC
Cary, John B	FRF
Chase, Leo	SLR; FRF; CRI
Chase, Cecil A	DIK
Clark, Walter D	KST
Cummings, Barnard	FRF
Curry, William	FRF
Cann, Frederick B	FRF
Claar, Stewart B	KST
Collins, Albert J	WFO
Conkling, Ronald	DIK
Compton, Earl V	DIK
Cross, Frederick R	FLR
Childress, Charles W	BST
Cunningham, Samuel D	BST
Conway, James V	PFO
Colton, Ralph M	EOT
Crothers, Donald H	DIK
Cotton, John B	PFO
Crippen, Earle Henry	SLR; EOT
Connolly, Barnard	FRF
Cutter, Charles E., Jr	TFT
Christie, Edward M	EOT
Coogan, Gardiner	PMT
Caley, John L	FRF
Crehore, John D	LHV
Cook, Joseph R	FRF
Cooper, Carl B	FRF
Cover, Carl A	DIK
Chalfant, Harvey O	FRF
Chatterson, Marshall C	DIK
Croxson, Albert M	PFO
Cundiff, William I	SMM
Chase, Leo	DIK
Calhoun, John Vernon	SLR; LDT
Clampett, Frederick W	EOT
Chaffee, Floyd M	FRF
Carroll, Alonzo M	FRF
Currie, Kent D	DIK
Carter, Edward V	FRF
Conner, Richard M	BST
Conrad, Max H	TFT
Coffman, Lionel A	FRF
Culbertson, Joe L	Note 2
Culbertson, Craig	Note 13
Campbell, Allan	Note 8
Cram, Ralph H	Note 3
Cook, Howard E	Note 2
Carter, Keith	Note 2
Clark, Russell	Note 2
Couzens, John Clark	Note 6

D

Donlin, Anthony B	SAG
Duncan, Thomas	WFO; WDM
DeCourcy, William E	TFT
Doggett, William K	FRF
Daley, Eugene F	FOB
DeGroot, Horace E	DIK
Degener, Paul A	EOT
Drennan, Leonard H	JMA
Dussere, Louis	DIK
Dingeman, Henry I	TFT
Dehman, Wallace W	TFT
Dougherty, Elmer L	FRF
Dominick, Lamont	DMA
Dougherty, Francis M	BFT
Davis, Harold F	MAT
Decker, Kenneth N	DIK
Doerr, Harry David	SLR; GLC
Davis, Rowland L	FOB
Daley, Henry Francis	SLR; PFO
Dean, John R	GLC
DeLoney, Albert F	CGC
Dana, Leslie V	KST
Davis, Paul A	DIK
DeCamp, Merritt J	DIK
Deacon, Ralph A	MAT
Dudley, John Kyle	SLR; LDT
Donovan, John C	DIK
Donovan, Lawrence J	DIK
Durar, George H	SMM
Dalton, William E	DIK
Denie, George R	TFT
Duke, John F. S	BST
Day, Stephen D	FRF
Dreher, Raymond C	BST
Ditty, Cecil A	Note 2
Dilworth, Dewees W	Note 2
Dodge, Gordon	Note 10
Dearden, James R	Note 9
Daddow, Samuel Harrics	SLR; Note 6

E

Elridge, Loyal A	FRF
Easterling, Anthony M	SAG
Eliason, Carl G	DIK
Ellis, Edgar H	FRF; DIK
Easley, Sam A., Jr	TFT
Early, Lawrence	DIK
Evans, Edwin B	DIK
Eastman, Stanley E	FRF; SLR; AAD
Elliott, Kerley C	TFT
Eagley, Karl Case	SLR; PMT
Earle, Ralph	DMA
Eisenchimel, Milton C	DMA
Elkema, Emil C	DIK
Elliott, Arthur E	FRF
Eldridge, John R	SLR; AAD
Erickson, Fridjot C	BST
Ernst, Grant W	PFO
Engesser, Benjamin Martin	SRL; PFO

F

Fitzmaurice, William J	JMA
Field, Howard	FRF; DIK
Fields, Curtis P	SAG
Francis, Olin C	SBI
Fonseca, Francis M	TFT
Fenwick, Herbert F	DIK
Fenton, Paul E	DIK
Farwell, Albert D	MAC
Farnum, William C	FRF
Fendrick, Raymond S	TFT
Fraser, Kenneth G	FRF
Fee, Ray E	SLR; AAD; FRF
Folsom, Harold J	FRF; KST
Frith, Edwin H	AFO
Folz, Charles J	FRF
Finlay, William Pound	SLR; EOT
Fisher, Randolph R	FRF
Fox, Edwin D	CAF
Ferree, David Scott	SLR; EOT
Foster, Ralph F	KST
Feldman, Hans A	FRF
Franck, George Theodore	SLR; KST
Fulwiler, Howard D	FRF
Farrell, Thomas J	CWT
Ferris, Thomas H	ELA
Fiske, Leland Emberson	SLR; GLC
Frank, Charles Henry Ernes	SLR; DMA
Furey, Emmett E	EOT
Fulwider, James H	DIK

Pilot of the British Royal Flying Corps examining an air bomb which he is to deliver to the Germans. (Official photo)

A hangar, with wind direction indicator, at one of the American aviation training camps in France

Furber, Fred N	FRF
Fish, Frederick L	TFT
Fuller, Robert N	PFO
Foreman, Carrol L	LHV
Farrar, Delwin B	FRF
Fischer, Karl W	DIK
Foster, Esty	TFT
Feldman, Hans A	DIK
Foster, William John, Jr	SLR; Note 6

G

Graetz, Walter C	GLC; SRC; Note 1
Gordon, James B	FRF
George, Harold L	TFT
George, Marshall W	FRF
Geisendorf, Louis C	TFT
Goodnow, Wallace F	RWT
Gay, Ralph Ebey	SLR; PMT
Garwood, Leroy E	FLT; VBW
Grove, Robert E	MAT
Goldsmith, Henry S	DIK
Godehn, Reuel A	SLR; AAD
Gross, Edward H	DIK
Gilbert, Arthur C	DIK
Gregory, Alexander S	FRF; KST
Gassaway. Crosby Mitchell	SLR; LDT
Garnier, Edward W	AFO
Gibson, Julius R	DIK
Garties, George	FOB
Giddings. Lee C	SBI
Ganey, Daniel F., Jr	KST
Graham, Garrett H	DIK
Gape, Leo B	CGC
Goetjen, Floyd L	DIK
Gregory, Clarence W	FRF
Grimm, John	EOT
Graham, Charles F., Jr	DIK
Gruny, George R	DIK
Gordon, Myron B	DMA
Gaskell, Ellsworth Francis	SLR; HHN
Gillies, Robert C	FLR
Gober, James L	TFT
Graves, Nelson M	AMV
Green, Dwight H	BST
Galinger, George W	TFT
Grimes, Carl A	DIK
Grady, Harold H	BST
Gore, William M	DIK
Goss, Lewis W	TFT

H

Hanlon, William Jones	SLR; FRF; AAD
Hawks, Horace G	FRF
Haddorff, Carl L	FRF
Hall, Edwin P	FRF
Harlan, Roger K	TFT
Heinitsh George M	DIK
Howard, Raymond E	FRF
Hayes, Martin A	FRF
Handwerk, Morris C	FRF
Heck, George L	TFT
Hartford, Claude E	TFT
Hastings, Edward Rogers, Jr	SLR; CRI; FRF
Hartman, Clarence Arthur	SLR; TFT
Hart, Jabez Waterman	SLR; TFT
Hall, George Linwood	SLR; TFT
Halle, Simon	KST
Hammond, Fred R	SAG
Hillhouse, John G	DIK
Hale, January R	FRF
Hunt, Ralph Van Nice	SLR; FRF; AAD
Hoag, Charles E	DIK
Haldeman. Ward F	DIK
Harvey, Frank A	DIK
Hibben, Robert C	PFO
Huntley, James W	PFO
Holmes, Beverly W	FOB
Hollander, Robert B	DIK
Howard, Robert Burnham	SLR; PFO
Halsey, Frank D	FRF
Hunt, David M	FRF
Heffley, Armor Simpson	SLR; CRI; FRF
Hager, Henry M	FRF
Harvey, Hadley	FRF
Huffman, George R	FRF
Harp, Charles E	CGC
Horner, Thomas Elmer	DIK
Hiatt, John B	DIK
Huking, Harry W	KST
Hanson, Howell Redd	DIK
Hymer, Herbert A	AFO
Haff, Warren C	FRF; TFT
Holborn, Clarence Edgar	SLR; AAD
Hall, William T. I	DIK
Heaney, John W	DAP
Heng, Jacob Arthur	DIK
Harvey, John R	DIK
Houlton, Raymond C	BST
Haywood, Chester B	PFO
Hoyt, Howard C	PFO
Henderson, James M	DIK
Hesser, John W	DIK
Higbie, Carlton M	DAP
Huber, Howard F	TFT
Heller, Wilson B	FRF
Herring, Lloyd H	FTF
Heffley, Armer S	DIK
Harris, Benjamin T	TFT
Hyde, Jules V	BST
Hillman, Charles A	LHV
Harpham, Edwin L	FRF
Hendricks, George F	GLC
Holmberg, John B	FRF
Henderson, Elmer J	DIK
Houston, Horace K	PFO
Hoffman, Jay F	LHV
Hegan, Chester P	TFT
Harriman, Walter F	GLC
Heine, Bernhardt E	PFO
Host, Thomas P	TFT
Howe, Jesse B	Note 3
Hussey, Clyde L	SLR; Note 4

I

Iglehart, Francis N	FRF
Ivins, Maurice H	TFT
Isbell, Charles Woodruff	SLR; Note 6

J

Johnson, Carl E	DIK
Johnson, Perry V	DIK
Jackson, Clyde H	TFT
Johnson, Courtlandt Spencer	SLR; PMT
Jenkins, Nelson D	FRF
Jacobson, Chester J	MAT
Jacobs, John F	FRF
Jones, William M	FRF
Johnson, James Victor	SLR; GLC
Johnson, Herbert L	FRF
Jones, Clifford E	FRF
Joy, Henry M	DMA
Jennison, John C	BST
Jackson, Oliver P	LHV
Jones, John D	Note 9

K

Kerin, Anthony J	CWT; MAT; Note 1
Kraft, Lawrence Fenton	SLR; LDT
Kohr, Hugo J	FRF
Kresge, Clyde L	DIK
Kelly, James N	SBI
Kennedy, Frank M	PFO
Kraus, Edwin Joseph	SLR; CAF
Keiner, Harry	DIK
Kull, George C	PFO
Knight, Rixford	FRF
Kneeland, Lyle A	FRF
Kirkland, Samuel N	FRF; KST
Knapp, Ralph A	MAT
Kinnebrew, Edward Robert	SLR; CAF
Kincaid, Alvan C	FRF
Kimball, Milton S	FOB
Kauffman, Cyrus S	FOB
Kanitz, Edwin C	GLC
Kelly, John O	DIK
Kirkendall, Freeman B	TFT
Kirby, French	TFT
Kelly, Wallace William	SLR; EOT
Kresge, Ellwood F	TFT
Kearney, John J	FRF
Kiely, Daniel	PFO
Keyes, Nelson B	GLC

Photograph of the Aviation Section, Camp Sevier, South Carolina, showing

Klein, Pressley B. .... FLR
Kampmann, John V. .... Note 14

L

Lisenbee, George M. .... AEO
Logel, Joseph F. .... SAG
Lowry, Henry D. .... TFT
Leek, John B. .... SAG
Lungren, Edgar E. .... FRF
Lyons, Philip T., Jr. .... TFT
Lambert, John David Wooster .... SLR; DMA
Lowe, Herman J. .... SLR; AAD
Luddy, Joseph Ladimore .... SLR; CAF
Lawrence, Clinton C. .... FRF; DIK
Lynch, Harry H. .... DIK
Liles, Fred C. .... FRF; DIK
L'Ehmann, Chester L. .... KST
Lyon, James Lowell .... SLR; PMT
Lucas, Ottis Perry .... DIK
Lobdell, Warren L. .... KST
Loving, Paul .... SLR; KST
Lyman, Richard S. .... BST
Linder, John .... GLC
Lobdell, Warren L. .... FRF
Lawson, William E. .... FRF
Lawrence, Harry F. .... DIK
Lewis, David E. .... FRF
Lunuquist, Harry M. .... TFT
Lowe, Larone .... Note 15
Lewis, Charles W. .... Note 2
Lewis, William .... Note 14
Littlejohn, Charles F. .... Note 2

Mc

McNeil, Guy L. .... FRF
McClymond, Ernest L. .... DIK
McChord, William C. .... JMA
McCormack, Thomas H. .... TFT
McAbee, Louis A. .... DAF
McKay, Harold A. .... DIK
McCollough, Henry F. .... FRF; DIK
McAllen, William D. .... DIK; FRF
McGhee, Leo Raymond .... FRF; DIK
McGrath, Michael F. .... FRF
McNabb, Harold R. .... FRF; DIK
McCullough, John Milton .... FRF
McDonald, Samuel F. .... FRF
McCabe, Alfred S. .... PFO
McClung, Hugh C. .... CWT
McNaught, Roy J. .... PFO
McHugo, Jack R. .... BST
McKinzie, Wesley RN..N..N..N..N .... GLC
McKinney, Oakley W. .... LHV
McElin, Bertrand J. .... PFO
McCord, Charles Gordon .... SLR; Note 6
McAdow, Lewis H. .... Note 2

M

Morrissey, Merle F. .... DIK
Morgan, Stuart A. .... SAG
Minturn, Benjamin E. .... TFT
Moore, Rush I. .... SAG
Morehead, John L. .... SAG
Miskovsky, Robert J. .... FRF
Magee, David W. .... TFT
Mills, Harold W. .... FOB
Mesnier, Edward S. .... TFT
Mitchell, Henry G., Jr. .... DMA
Mehlhop, Thomas P. .... DIK
Meeker, Nathaniel H. .... TFT
Magee, Christopher .... DIK
Mowry, Jared J. .... DIK
Morgan, Dwight C. .... DIK
Marincik, Joseph A., Jr. .... FRF
Murphey, Harvey W. .... FRF
Micelli, Paul .... FRF; TFT
Meyer, Jerome G. .... FRF; DIK
Miller, Edward A. .... FRF
Marriner, Alfred W. .... CGC
Minter, Clarke C. .... FRF
Myers, Carl H. .... DIK
Miller, Ray E. .... FRF
Matthiessen, Ralph H. .... HHN
Mook, Harold F. .... PMT
Merrick, Ward S. .... FRF; DIK
Moffet, Ralph C. .... SLR; FRF; AAD
Mahler, James B. .... FRF
Macauley, Alexander V. .... FRF
Manley, Harvey S. .... FRF
Murphey, William Herbert .... FRF
Martin, Roland H. .... FRF
Montgomery, Edward G. .... CGC
Merrill, Leland H. .... AFO
Miller, Robert Lee .... SLR; AAD
Martin, Burban A. .... FRF
Mason, Richard A. .... FRF
Merrill, Clyde Holahan .... SLR; CAF
Murray, H. Sinclair .... FRF; KST
Manzelman, Earl H. .... BST
Morris, John E. .... BST
Miller, Edward Frederick .... SLR; AAD
Masson, Charles A. .... DIK
Mills, Davis W. .... DIK
Meisenheimer, Floyd B. .... EOT
Meyers, Marion T. .... PFO
Macomber, Henry W. .... TFT
Morris, Edward S. .... GLC
Minshall, Robert .... TFT
Moye, Frank L. .... GLC
Massey, Raymond R. .... GLC
Merill, Keith B. .... GLC
Mason, Clesson E. .... FRF
Mosher, Ralph H. .... FLR
Miller, Frank M. .... FRF
Martell, Alfred .... PFO
Metcalf, Herbert Edmond .... SLR; SRC
Martin, Milton R. .... DIK
Manley, Henry S. .... DIK
Morthland, Merle A. .... TFT
Maxwell, Fred C. .... DIK
Murray, John G. .... DIK
Machle, Jerome B. .... TFT
Moss, Harry S. .... TFT
Morse, Eugene D. .... TFT
Moores, Edward A. .... FRF
Means, Leland M. .... SLR; AAD
Meldahl, Carl J. .... GLC
Miller, George W. .... BST
Martin, Howard C. .... TFT
MacDonald, Walter Scott .... FLR; Note 12
Mabee, Leroy Ray .... SLR; Note 6

N

Nourse, Roderick .... SAG
Nelson, Roy A. .... DIK
Noyes, Linwood I. .... FRF
Nunn, William T. .... FRF
Neubauer, Arthur J. .... AFO
Neubig, Earl E. .... MAT
Newsom, Albert Sidney .... SLR; CAF
Niblack, Polk H. .... SBI
Nichols, Luther A. .... GLC
Nigh, Gordon K. .... FRF
Noyes, Charles M. .... DIK
Nott, Sherrard G. .... TFT
Nichols, George W. .... EOT
Naumann, Arthur P. .... TFT
Neely, Harold R. .... DIK
Nordby, Julius Edwarl .... SLR; Note 6

O

Otstot, Robert E. .... CWT; MAC; Note 1
Orr, Douglas William .... SLR; ALF
Orr, Harold E. .... TFT
O'Neill Charles .... TFT
Olin, Alfred L. .... FRT; TFT
Olston, Frank M. .... FRF
Osment, Horace .... FRF
Otis, Thomas F. .... KST
Orand, David Howard .... SLR; HHN
O'Connell, Robert E. .... GLC
Ort, Karl S. .... GLC
Organ, John D. .... LHV
O'Conner, Burdett Hitchcock .... SLR; GLC
Ogden, James B. .... SLR
Oglivie, Alexander K. .... PFO

P

Pearcy, William H. .... REL
Phillips, Robert F. .... TFT
Parker, Herbert N. .... TFT
Price, Owen N. .... SAG
Payne, Owen S. .... DIK
Patterson, Robert E. .... TFT
Phillips, Donald B. .... TFT
Perry, Maurice R. .... DIK
Pearson, Russell H. .... DIK
Prior, Rodger W. .... DIK
Pritchard, Chester E. .... FRF
Parkhurst, Amos J. .... FOB
Packard, Harold A. .... FRF
Pliska, John S. .... LDT
Penfield, Charles C. .... SAG
Plettner, Walter E. .... SBI
Porter, Oscar S. .... FRF
Pendleton, Talbot T. .... BFT
Pye, Harvey N. .... DMA; CGC; Note 1
Peterson, Fred R. .... DIK
Paynter, Henry Martyn, Jr. .... SLR; FRF; AAD
Putnam, Marion G. .... CWT
Perkins, John M. .... FOB
Pierson, Stanley H. .... DIK; FRF
Plummer, William L. .... GLC
Price, Simeon T. .... CGC
Pendleton, Littleton F. .... FRF
Paulson, Carl F. .... KST
Peterson, Vance C. .... KST
Peterson, Roger F. .... FRF
Potts, Edwin Bernard .... CSO
Polhemus, Josiah Arven, Jr. .... SRL; PFO
Pinkstaff, Everett W. .... EOT
Porterfield, James K. T. .... FRF
Perry, William L. .... DIK
Prior, Emery C. .... FRF
Pitts, Younger A. .... GLC
Philips, Paul H. .... EOT
Park, James W. .... DIK
Payne, Bryan W. .... FRF
Potter, Duncan M. .... LHV
Page, Henry L. .... BST
Pratt, Eric T. .... PFO
Parsons, Gustav A. .... GLC
Pennefather, J. Sheridan .... FLR; Note 16; WDM

Q

Quinlan, Charles G. .... FRF
Quinneen, Charles R. .... LHV

R

Radcliffe, Harry E. .... DMA
Rogers, Henry S. .... FRF
Ray, Harvey T. .... SAG
Russell, Laurence L. .... SAG
Rome, Robert C., Jr. .... DIK
Robertson, James B. .... TFT
Robinson, Malcolm G. .... SAG
Reasoner, Nathan R. .... FOB
Russell, Ralph C. .... FRF
Redman, Mark H. .... CWT
Roche, Felix R. .... WFO
Reid, Kenneth M. .... TFT
Richardson, Ernest L. .... PFO
Reed, John S. .... FRF; DIK
Rhine, Mel .... SLR; PMT
Rice, Hubert M. .... FRF

(Continued on page 931)

dets and tents. (Photo by The Miller Studio and Press Illustrating Service)

A GRUMBLE ABOUT GLUE

By LT.-COL. MERVYN O'GORMAN, C. B. D. Sc.

IT is often overlooked that intense study of detail is essential to aeronautical progress, and I have chosen this subject by way of illustration. Of all unpromising subjects for an article, I suppose "glue" may be said to occupy almost a premier position. Let us, however, venture upon it to see if it offers any field of suggestiveness.

Glue, if we had the ideal thing, brings in the possibilities, so valuable in war, of high-speed construction and of labor economy. It also makes for an appreciable saving of wood.

Ply wood constructions of various kinds, by reducing the amount of steel and of machined and pressed metal parts in aircraft, tend to expedite manufacture. They do not add to the weight or to the labor of erection of the components using ply wood; on the contrary. Moreover, they do more than add an element of high speed in manufacture and light weight in the finished article, they permit us to get, by means of the circular cut, sheets of material larger and much wider than the original tree. This advantage in the size of the raw supplies available will become more precious as aircraft become larger. Ply wood thus is a very valuable aircraft material already, but its full utility can only be secured by the development of a proper adhesive between the plies. I am well aware of the excellence of the current product, but I am asking that we shall aim much higher. The gap to be bridged between our glueing possibilities of today and a real adhesive is handsomely illustrated by the existence of the elaborate and expensive process of sewing mahogany boat and seaplane hulls with copper wire. To effect a durable union of parts to compete with such copper sewing is our ideal.

For wing spars what we want, and what will always be valuable, are uniform pieces of great length. We have such timber, but we waste it. When we have, at great cost, secured a straight-grained and knotless tree, and picked out the prime cut, we turn 30 per cent of it into wood shavings and chips. The H type girder of spruce, made for lightness by "spindling" out the sides of the beam, expends more spruce and produces more scrap wood in the form of shavings, than if the same tree were cut into thin planks and the spar built up of flat top and bottom members connected by a webb artificially fixed in position. Just now we rarely use girders with screwed and glued sides either of ply woods or thin boards.

The ultimate ends of glueing is to produce a correct representation of a continuous piece across the glued joint. If good mechanical connection could be made betwen the top and the load was distributed to all parts a swell as in the spindled spar, and if this connection could be made tenacious by firm glueing, we should always add on bits instead of our present converse process of hollowing out large beams for the sake of leaving local excrescences. The relief obtained on the shortage in timber of good length (in excess of 12 or 20 feet) would be quite appreciable.

An adhesive for these and like purposes must give uniform performance as reliably as sugar gives sweetness, or else it cannot be used, save as capable of its lowest strength. Uniformity can not be expected unless it be prepared in accordance with some rigidly enforced recipe. It must consist of something approaching to a definite mechanical mixture of things, known to be susceptible of accurate reproduction, having a definite chemical composition or used in a definite physical state. If the chemistry of these colloids is too intricate for verification by the user's workshop methods we can approximate to the desired result by knowing first of all substances aircraft glue shall be made from. If it is based on fish bone or gelatine, etc., what fish bones or whence shall the gelatine be derived, and how prepared? If several substances enter into the glue, what are these preparations, and how mixed? There may be some danger in suggesting that a specification for the making of glue is needed to be enforced. I should far prefer that a specification should call only for results, not for composition, analyses of components, or methods of preparation. If a specification of results *can* be prepared, and can be currently enforced, this would be far less hampering to ingenuity and enterprise than a definition of components and treatment. I only plead that by one or the other of these means constancy of results must be attained.

Perhaps the greatest bar to progress in glueing is the difficulty of finding anyone who can say what is the result desired. Every carpenter thinks he knows; but get the matter put down in plain figures, and we find a result of zero intelligibility. Some tensile strength is needed, and it should remain when the glue is dry and set. What tensile strength *must* we have in the solid or dry glue specimen under test? When is glue dry? It is clearly no use asking for a strength equal to that of alloy steel in tension, compression, or shear. An expression of desiderata in any such over-exalted form produces no stimulus whatever to meet the want. Some power of permeating through the surface of a piece of wood is apparently needed of a glue; but we are not very sure even of this, since glue will connect together two pieces of glass so that the glass tears away before the glued faces part. I am quoting Dr. Walpole, but I believe the fact is common knowledge. It is unlikely that permeation of the glass by the glue had occurred. Suppose, however, that the permeating quality by which the solvent of the glue (water usually) carries the adhesive into the grain and interstices is recognized as valuable; can this permeating quality be measured? Does it fall off with dilution, and also with excessive concentration? Is it the same for any one glue solution with all woods, and, if not, what are the differences desirable for different woods? What is the chief weakness of glue? Does it mainly fail in shear? When a glued joint is tested and described as "good because the face of the wood was pulled away without breaking the glue," does this really show that the glue was good? Or does it only show that the transverse strength of the wood itself was weakened by the glue which penetrated it? What about shock and the effect of shock—viz., vibrations transmitted in glue? Do these disintegrate it or crack it or crumble it, or is the crumbled state sometimes found in old glue joints that have parted exclusively due to micro-organisms which have altered its character? Must we keep out such micro-nuisances with a permanent antiseptic? And if so, what? I do not pretend that nothing is known on these points by the world of science, but it is sufficiently clear that very little of it has leaked out to the ordinary user.

Next, when we have got the glue, it seems likely that when used it should be applied at some standard fluidity and temperature. Whether this should be determined by the employment of a simple specific gravity bubble in the glue pot, such as is used in accumulators, or by some other simple shop expedient, is immaterial at present. There may attach no importance to fluidity and heat, for we certainly act as if they were very minor matters; but who has the proof, and, if a wide range is allowable, what are the limits? This is not all. It is probable that the make-up water for the glue pot should not be tap water, since it is hardly likely that the furry deposit of chalk, well known in the domestic kettle, can add either to the adhesiveness or tensile strength of the contents. Yet such matters must accumulate when the glue is permanently on the simmer.

The suggestion is then, first, for a research. A good physio-chemist's time for a year or so is involved. After that we might have standardization and some recognized good procedure for needed. We have to know how far minute dampness or excessive dryness of the wood at the time of glueing affects the glue which enters into the pores. What is it that facilitates or prevents the mechanical keying? Investigation would presumably be made on some glues which are already esteemed by the practical carpenters of the more careful aircraft manufacturers. The relation, if there be one, between the strengths in tension, compression, and shear of the glue itself should be found, and the effects of these qualities on the ability of the glue to form a good entry into the pores of the wood must be studied for the purpose of selecting which ever is the most satisfacory combination in practice. Supposing all this knowledge to have been sifted out, we must go further. A glue which will soften and swell slowly when exposed, say, for a month to cold water—*i.e.*, to the average English weather—will begin to let go. Can such glue be treated, after application to the wood, with some chromate or other substance for rendering it insoluble in water? Can we achieve this without detracting from its hold on the wood or its tensile or other properties? Can we call to our aid the effect of actinic light of other ether vibrations to effect a molecular change? Shall the ordinary glueing operations be performed in what a photographer calls a dark room? I believe that attempts have been made to introduce the chromate into the glue before its application to the wood, but I think experience showed that such admixtures render the glue difficult to handle, and lead to wastage of that material which happens to remain behind in the glue pot.

The investigation, which I think is already in hand at the R.A.F.—viz., to discover what ingredient can be added to glue without spoiling it, to prevent it becoming a culture ground for micro-organisms, is very important. Micro-organisms enter and breed in moist glue, consume it, and turn it largely into water. They are enemies and should be excluded, so far as one can say at present.

The programme of work sounds a very large one. It is, perhaps, less arduous than it sounds if there exists already, as may be surmised, a good deal of knowledge secreted in the odd corners of British industries, as, for example, amongst cabinetmakers, makers of hollow ships' spars, and amongst those who apply veneers, etc.

We are by no means tied down to *glue* any and all gums, gelatines, colloids, are open to use. Shellac has its possibilties, and is exceedingly water-resisting. Provided the result is achieved, I do not think we need worry whether this result is obtained by means of gums or Portland cement or plaster or starch paste or any device which will stick together the things we want to stick.

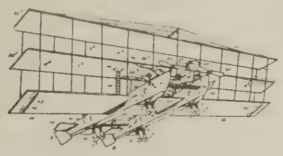
In aeronautics we are in a branch of engineering as novel as once was dynamo design. Electrical engineers grumbled in their earlier days at the hard lot which obliged them to transmit a hundred horse power through a complex of soft copper, cotton, sealing wax, varnish and tape. These *un*-mechanical substances were a persistent source of trouble. Now the business of making and using insulations has advanced to such a pitch that there is no machine so little liable to failure as a dynamo or alternator. The aeroplane is now in a position analogous to that of the Elephant dynamo or the Brush arc lighter. We expend 600 h.p. on forcing a structure of sticks and linen through the air—a glorified power-driven umbrella. The fastening of the linen to the sticks by countless little brads is testimony not only to our ignorance of adhesives, but to the fact that we badly want them. The sooner we start inquiry scientifically into this matter the better for us all.

RECENT AERO PATENTS

BY WILLIAM N. MOORE

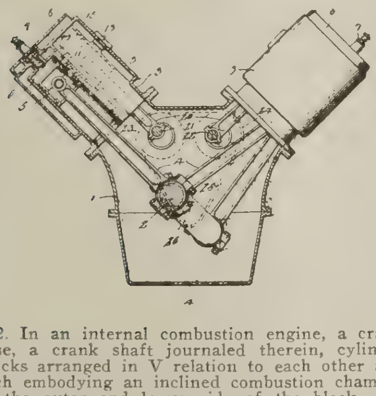
1,263,676. HYDROTRIPLANE FOR ARMY PURPOSES. MARTIN JELALIAN, Cranston, R. I. Filed December 3, 1917. Serial No. 205,044. (Cl. 244—13.)

1. An apparatus of the character described, a hydrotriplane comprising of two main body sections or cars located side by side and extending longitudinally to each other, each of said body sections consisting of three metallic frames having a series of vertically arranged connecting supports surrounding the same, a wire netting secured to said supports of each of said cars and a layer of emery cloth secured to the latter, a small plane arranged between said cars and the ends of the same being secured to the middle frames of the same, and said small plane made of a series of connecting supports, a wire netting and a layer of emery cloth secured to the same, planes projecting outwardly from the middle frames of said cars and having buoyant cylinders secured upon the bottoms thereof.



1,261,530. INTERNAL-COMBUSTION ENGINE. HENRY J. HICKEY, Fort Dodge, Iowa. Filed Apr. 27, 1917. Serial No. 164,987. (Cl. 123—55.)

1. In an internal combustion engine, a crank case, a crank shaft journaled therein, cylinder blocks arranged in V relation to each other and each embodying an inclined combustion chamber and inlet and exhaust chambers which communicate with the combustion chamber through separate ports both located immediately adjacent to the cylinder head, reciprocatory pistons in said cylinders connected to said crank shaft, piston valves mounted to reciprocate in said inlet and exhaust valve chambers, parallel rotary valve shafts journaled within the crank case, connecting rods between said valve shafts and the piston valves, and driving means between the crank shaft and said valve shafts.

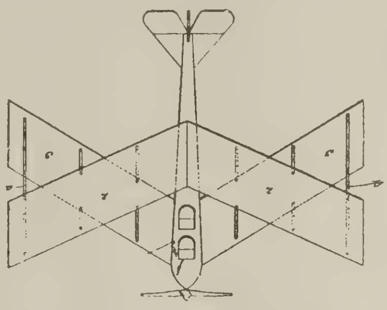


2. In an internal combustion engine, a crank case, a crank shaft journaled therein, cylinder blocks arranged in V relation to each other and each embodying an inclined combustion chamber at the outer and lower side of the block, and inlet and exhaust chambers at the inner side of the block, reciprocatory pistons in said cylinders connected to said crank shaft, piston valves mounted to reciprocate in said inlet and exhaust valve chambers and each provided with a through port, parallel rotary valve shafts journaled within the crank case above the crank shaft, connecting rods between said valve shafts and piston valves, sprocket wheels on said valve shafts, a sprocket wheel on the crank shaft, and a chain extending around said sprocket wheels for transmitting motion from the crank shaft to the valve shafts.

1,264,037. FLYING-MACHINE. RUPERT A. EMMONS, Washington D. C. Filed April 5, 1916. Serial No. 89,091. (Cl. 244—12.)

1. A flying machine having supporting planes so arranged that during one or more longitudinal angulations of the machine with respect to its line of flight, the wings of one or more planes will present to this line of flight a negative dihedral, and the wings of one or more other planes will present to this line of flight a positive dihedral, and the wings of these planes will be so arranged that those presenting a negative dihedral to the line of flight will be raked outwardly and rearwardly, and those presenting a positive dihedral to the line of flight will be raked outwardly and forwardly.

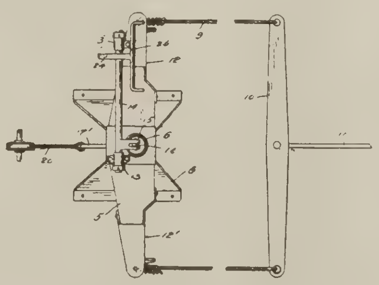
2. A flying machine provided with supporting planes, the wings of certain of these planes being dihedrally angled downwardly and raked to the rear, and the wings of other of these planes being dihedrally angled upwardly and raked to the front.



12. A flying machine having a supporting surface of which certain wings or lifting planes or sections of lifting planes are dihedrally angled in an outward and upward and forward direction, and of which certain other wings or lifting planes or sections of lifting planes are dihedrally angled in an outward and downward and rearward direction.

1,264,498. CONTROLLING DEVICE FOR AEROPLANES. JAMES C. FOLEY, Seattle, Wash., assignor to Boeing Airplane Company, Seattle Wash., a Corporation of Washington. Filed January 16, 1918. Serial No. 212,026. (Cl. 244—29.)

2. In an aeroplane, the combination with the rudder thereof, a foot lever operatively connected with said rudder for steering purposes, another operative part of the aeroplane, a treadle device mounted on said foot lever to be oscillated therewith, and operative connections between the pedal device and said operative part whereby the latter may be selectively controlled through the instrumentality of the pedal device from any position of the foot lever.



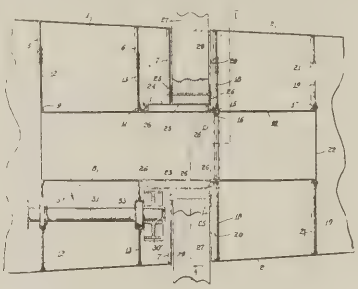
5. In an aeroplane, a steering foot-lever having a tubular fulcrum, a standard having a journal bearing for said fulcrum, a throttle valve, a pedal device mounted on said foot-lever, and operative connections between said pedal device and the throttle valve, said connections including a torsional rod extending through said tubular fulcrum.

(Claims 1, 3, and 4 are not printed in the Gazette.)

1,262,660. AEROPLANE. EDSON F. GALLAUDET, Norwich, Conn., assignor to Gallaudet Aircraft Corporation, New York, N. Y., a Corporation of New York. Filed April 21, 1916. Serial No. 92,597. (Cl. 244—25.)

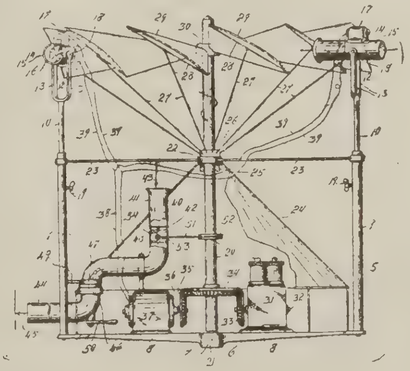
3. In a flying machine, a hollow pisciform body, a plurality of gas engines mounted side by side within the body, a radiator for the engines set across the interior of the body forward of the engines, a propeller mounted within the body to the rear of the engines with blades projecting outwardly through a transverse opening in the walls of the body and adapted to draw air through the radiator and past the engines, and means for operatively connecting one or all of the engines with the propeller.

7. In a flying machine, an elongated hollow body of substantially stream line form divided transversely into front and rear sections, a hollow cylindrical drum rigidly mounted within the rear end of the front body section, a propeller mounted to rotate upon the drum immediately behind the rear end of the front body section, a driving shaft geared to the hub of the propeller and mounted to rotate in bearings rigidly secured between the drum and the walls of the body section, and means for securing the rear body section to the drum immediately behind the propeller.



1,264,712. AERIAL APPARATUS. HOWARD P. TWEED, Denver, Colo., assignor to Benjamen F. Seymour, Denver, Colo. Filed Oct. 12, 1908, Serial No. 457,289. Renewed September 29, 1917. Serial No. 194,084. (Cl. 244—19.)

2. In aerial apparatus, the combination with a suitable frame work and a propeller equipped with blades, of means for operating the propeller and independent means adjustably mounted on the frame work and lying between parallel planes cutting the zone of rotation of the blades at right angles to the axis of the propeller, for menchanically discharging air currents into the path of rotation of the propeller blades for creating auxiliary atmospheric resistance.



15. The combination of propeller blades initially operated by any suitable power, with means independent of the blades themselves and lying between parallel planes cutting the zone of rotation of said blades for delivering resistance fluid to the zone of rotation of the propeller blades for the purpose set forth.

[Claims 1, 3 to 14, and 16 not printed in the Gazette.]

Offers to Fly to Europe

The Aero Club of America, pursuing plans for the projected transatlantic aeroplane flight, have announced that they have received a number of offers from American aviators to undertake the flight. In addition to these they have received one from Clifford Prodger, an American aviator, at present living in England. In his message Mr. Prodger says that he is willing to undertake the flight by way of the Azores.

FOREIGN NEWS

FRANCE

The French official report for July 8 said:

On July 6 and 7 fourteen enemy aeroplanes were brought down or put out of action and two captive balloons were set afire. Our bombing machines dropped eight tons of projectiles in the course of their expeditions at night in the neighborhood of Fismes, Hirson, Fere-en-Tardennois and Amagne Luquy.

GREAT BRITAIN

Our balloons and observation machines carried out much valuable work on July 6. There were few combats in the air. Three German aeroplanes were destroyed and one was driven down out of control. One of our machines is missing. Seventeen tons of bombs were dropped on various targets.

On the afternoon of July 6 our squadrons successfully attacked the railways at Metz-Sablon. Two and a half tons of bombs were dropped on this objective. Our formations were attacked over the objectives by enemy machines, one of which was driven down. All our machines returned safely.

During the night of July 6-7 our machines successfully attacked the railway station and sidings at Saarbrucken and railways at Metz-Sablon.

Hazy weather interfered with the work in the air on July 7 and observation was difficult. Seven enemy aeroplanes were destroyed during the day and four were driven down out of control. Three of our machines are missing.

We dropped sixteen tons of bombs during the day and the following night, the principal targets attacked being the Ostend docks and the railways at Tournai and Courtrai.

The station and factories at Kaiserslauten were attacked. Hostile machines were engaged over the objectives and one of them was shot down.

On July 8 the railway station, workshops and sidings at Luxemburg were bombed by our squadrons. Bursts were observed in the station and also in the workshops.

In spite of low clouds in the morning of July 8 and thunderstorms later in the day, our aeroplanes accomplished a good deal of photographic, observation and reconnaissance work during the intervals of fine weather. The enemy activity in the air was slight.

Seven German machines were destroyed and six driven down out of control. Four of our machines are missing.

Nineteen tons of bombs were dropped, principally on railway connections, at Roulers, Tournai and Wavrin, and on dumps at Warneton and Bac St. Maur. Practically no flying was possible at night.

British naval aeroplanes in the period between July 4 and July 7 dropped six tons of explosives on German works at Ostend, Zeebrugge and Bruges. Direct hits were observed on buildings and vessels. Five German aeroplanes were destroyed and three others were driven down out of control. All the British machines returned.

In air battles along the northern British front on July 10th, according to an official statement, nine German machines were destroyed and one other was driven down out of control. A hostile scout also was brought down by anti-aircraft fire.

British bombing parties dropped explosives on various enemy targets, including Lille Junction and the Bruges docks. Three British machines failed to return.

The British air raid on Coblenz July 12th was the severest of the war, according to a Basel dispatch to the *Express*. Twelve persons were killed and twenty-three injured

The northern part of the station was seriously damaged and the Rhine and Moselle bridges and the royal palace were hit. Great damage was done to thefortress of Ehrenbreitstein.

Bad weather conditions interfered with aerial activity on July 11 and 12, and only five German aeroplanes were accounted for by the British on those days, the Air Ministry announced. Three British machines were lost. More than nine tons of bombs were dropped.

"On July 11, heavy rainstorms limited activity in the air on both sides, but our machines carried out reconnaissance work and observation for the fire of our guns whenever brighter intervals permitted," the statement said.

"Nine tons of bombs were dropped on railway junctions behind the German lines. Three hostile machines were destroyed during the day and two were driven down out of control. Three of our machines are missing.

"During the night of July 11-12, our machines successfully bombed three enemy aerodromes, at two of which fires broke out. Many rounds were fired from machine guns at trains, searchlights and other military objects.

"On July 12, the railway sidings at Saarburg were attacked. All our machines returned safely."

Twelve enemy aeroplanes were destroyed by us on July 13, and four were driven down out of control. Three of our machines are missing.

A good deal of reconnaissance and observation work was carried out by our airmen in the intervals, and four and a half tons of bombs were dropped by them during the day.

On the night of July 13-14 our bombing machines were very active. Over 1,100 bombs, weighing in the aggregate nineteen tons, were dropped upon enemy camps, railway lines, trains, transports, and billets. All our night-flying machines returned safely.

GERMANY

The official communication issued by the German War Office on July 14th follows:

"Our bombing squadrons made night attacks against enemy railway works on the French coast between Dunkirk and Boulogne. At Abbéville, and in the regions of Lillers, St. Pol, Doullens, and Crépy-en-Valois and at Villers-Cotterets."

The headquarters report has this to say of recent aerial operations:

"During June 468 hostile aeroplanes and 62 captive balloons were shot down on the German front. Ninety-two of these aeroplanes were brought down by our anti-aircraft guns. Of these aeroplanes 217 are in our possession. The rest were observed to fall behind the enemy positions.

"We lost 153 aeroplanes and 51 captive balloons in battle."

The Germans reported that eighteen enemy aeroplanes were shot down on July 9, and that on July 11 " Five American aeroplanes of a squadron of six, intending a raid on Coblenz, fell into our hands. The crews were taken prisoners."

ITALY

The Italian War Office reported on July 8:

Eight hostile machines were brought down in air fighting.

The air superiority of the Entente Allies on the Austro-Italian front is indicated by the figures made public on July 8 dealing with the ten days' offensive of the Austro-Hungarians in June. The Allies, including American pilots, operated 120 chaser planes and destroyed 107 Austrian aeroplanes and seven observation baloons. The Allies losses were seven aeroplanes brought down in the enemy lines and three balloons. Three Allied pilots were killed, six were wounded and seven are missing.

Three thousand observation photographs were taken and 5,000 bombs, weighing seventy tons, were dropped by Allied airmen. Italian observation balloons signalled nearly 4,000 positions of enemy artillery and directed the fire of nearly 1,000 guns.

ENGLAND

A despatch from London dated July 2nd says: "Young Germans learning to fly are deserting into Holland wholesale.

"Whole batches of German pilots training at Nivelle in Belgium," says a British official statement, "secreted stores of petrol and flew across the Dutch frontier, where they were surrounded and interned."

The reason for these defections, it is learned, are that wastage among German aviators has forced the army authorities to coerce recruits, that the coerced recruits find the "intensive training" intolerable, and that training accidents abound.

A later dispatch sends the following: Three more German airmen, deserting their country, have landed in a giant seaplane at Masnedsund, on the island of Masnedo, off the south coast of Seeland, Denmark.

The machine belonged to the second German battle fleet and bears the number 21 B. There were no arms or ammunition, or even telescopes on the seaplane, which indicates that the nature of the airmen's flight was surreptitious.

Like to Keep War Restricted

Amsterdam—Rumors are being circulated here that Germany is considering a proposal to the Allies that a mutual agreement be reached against bombarding towns outside the war zone. The sentiment in favor of such a move is said to be strong in Germany.

German Airmen Kill Nine Women in Hospital Raid

London.—Nine young women, members of the Women's Auxiliary Army Corps, were killed in the German bombing raid on British hospitals in France May 30th.

German Aeroplane Lost Off the Jutland Coast

Washington.—A German aeroplane was lost off the western coast of Jutland on July 4th with its crew, according to an official dispatch from Copenhagen. The plane was one of a squadron of four flying at full speed toward the South, and was seen from the shore to fall. Danish lifeboats went to the aid of the aviators, but could rescue none.

GREAT BRITAIN

British Airman Also Bagged Six German 'Planes in One Day

Captain John L. Trollope, the young British airman who established a world's record by bringing down six enemy machines in one day, is a prisoned and wounded, according to news received by his parents. He had been reported missing.

FRANCE

Versailles Discussion End with Order for Attacks on Battlefront Only

The "Echo de Paris" says it learns that the question of the unity of tactical and strategical aims of the Allied aviation services was discussed at the recent meeting of the Supreme War Council at Versailles by the technical experts of the several nations represented.

From this it developed, adds the newspaper, that additional raids at present on German cities were not deemed advisable, as other efforts by the air forces were more necessary at this juncture, the view being that all the Allied aviation efforts should be centred upon the firing line and the territory behind the lines.

GREAT BRITAIN

Two Aeroplanes Locked Together in Mid Air

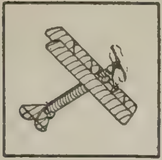
A thrilling story of a collision in the air was told at an inquest held by an Eastern Counties coroner on the body of Lieutenant Owen Hewitt Dampier Bennett, of the Royal Air Force and belonging to Birmingham.

A brother officer describing the collision said he was up about 700 feet, when Bennett flew over him between 300 feet and 400 feet higher and suddenly fell. Witness tried to get out of his way, but had not sufficient speed to clear the aeroplane. The nose of his machine jammed in the under carriage of Bennett's machine and they locked together. Both aeroplanes rolled over and over for 300 feet, and then witness's machine broke adrift, smashing the lower planes of the other, which crashed to the earth.

A verdict of "Accidental death" was returned.

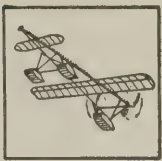
Britain to Use Women in Her Air Forces

Employment of women as aviators is intended by the British Government, George H. Roberts, labor minister, declared in a speech at Sheffield while referring to the important part that women are playing in industry. The minister said he believed women would make very good aviators.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

INHERENT stability is a problem that aeronautical engineers have tried to overcome since the first flight of the aeroplane, and up to now they have only partly succeeded in making the aeroplane stable.

Inherent stability means that no matter what outside forces act on the machine to throw it into a nose dive or a side slip, it will always come back to its normal position. The Burgess-Dunne, and the old German Taube were machines having inherent stability.

A machine of this type while possessing excellent qualities for sporting or commercial aeroplanes, works just the opposite when used for war purposes, because the fighting aeroplane must be of such design that it will answer readily to the will of the pilot, such as the strategical manœuvres a pilot must make to throw off, or overcome an enemy.

With a machine of the inherently stable type it would be hard to make an Immelman turn, loop, or corkscrew, because while the pilot would use his controls to throw the machine into the position he would choose, the machine itself would try to stay at normal and of course it would be sluggish, and useless for fighting, but as a sporting type or for commercial use this will be the type of machine in the future, as it allows the pilot to rest at times and he would then be able to fly many times the distance he could cover in a machine of the unstable type and without exertion.

By studying the examples shown in the accompanying drawing the reader will clearly see how an aeroplane can be designed to be stable.

Fig. 1 shows a model with wings set at what is known as a dihedral angle, just below the model, a front view of a boat with a "V" bottom is shown, how these two resemble each other in principle is shown at Fig. 2. The boat although thrown over on its side by a wave is still safe because the "V" bottom of the boat now presents a flat surface to the water and the centre of gravity will hold it in this position and when the wave drops off it will go back to normal.

The model above is in the same position as the boat, the cross wind, arrow A, is trying to turn the machine over on its side, it does so, until the left wing reaches a horizontal position, then the lift on this wing increases and the lift on the right wing drops off because it is now at an extreme angle and the machine returns to its normal position.

The reader will see that one wing is getting more lift than the other, naturally, the side getting the greatest lift will rise and the one losing lifting power will fall.

In Fig. 3, a machine of the unstable type is shown, and directly below it, a flat bottom boat, how these two resemble each other is shown at Fig 3. The wave lifts the boat over on its side, and having no flat side as in the "V" bottom boat, it is in danger of overturning. This is also the case in the model above it, the wind, arrow A, is lifting the machine over on its side, both wings are getting the same lift so there is no force trying to right the machine and the consequence is the machine starts to side slip and before long gets into the position shown in Fig. 5, and the pilot would have to use his controls to bring the machine back to its original position.

Now this is for lateral stability only. For longitudinal stability it is necessary to have the tail plane set at sort of "V" to the main plane.

Fig. 6 shows a model that is logitudinally unstable, because it has what is known as a lifting tail, and the machine has two forces to overcome the weight of engine, etc., arrow W and the lift of the tail, arrow B, the result is the tail starts to travel in the direction indicated by arrow C and before long would put the machine in the position shown in Fig. 8. The machine would then nose dive and travel in the direction shown by arrow R, because the lift of the elevator and main plane tends to keep the machine moving to the right and the weight of the machine keeps it moving down and the resultant is indicated by arrow R.

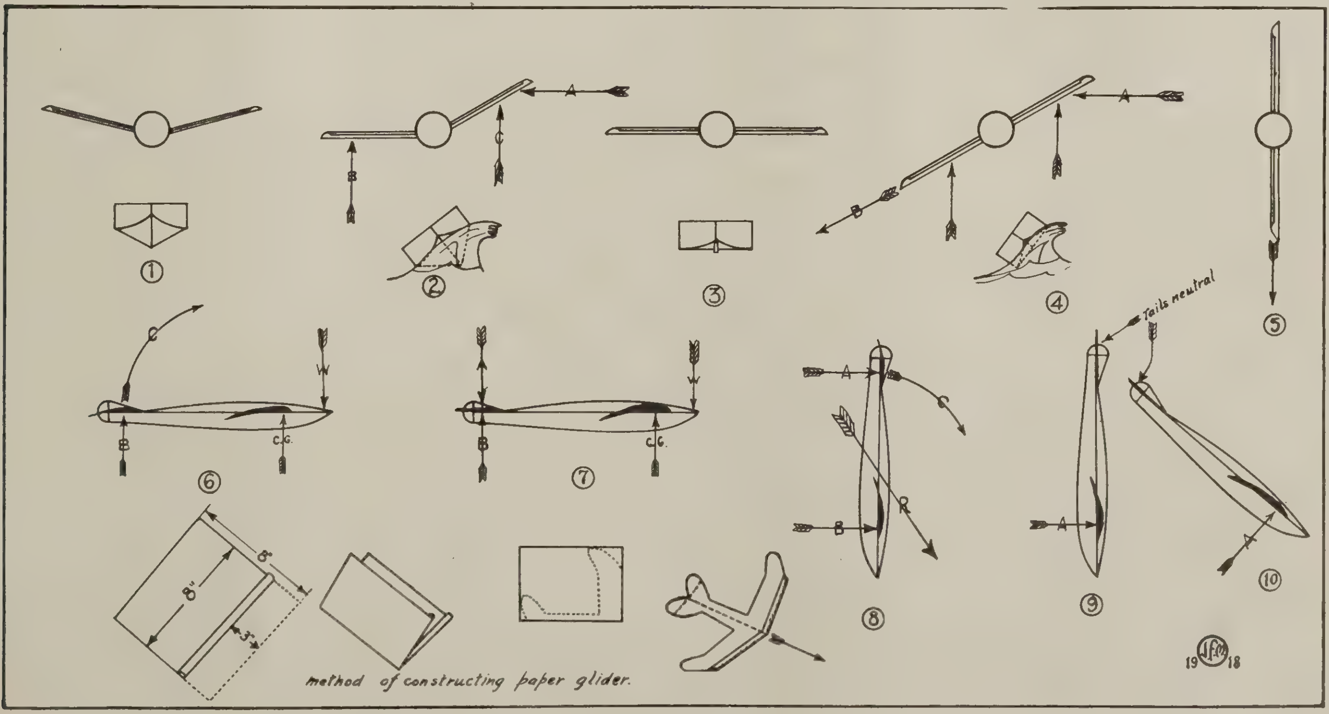
Figure 7 is a model having longitudinal stability because it is so designed that it does not need a lifting tail, instead it has a neutral tail acting somewhat as the feathered end of an arrow. The forces acting on this tail are equal, and the result is the tail remains neutral. Should the machine nose dive as Figure 9, the tail being neutral and the main plane having a lifting force which tends to move the nose to the right, the result is the machine soon arrives at the position in Figure 10, and eventually flattens out to its correct position.

Should the reader have any difficulty in grasping the explanations set forth in this article I would advise making a simple paper glider as shown at the bottom of the drawing. The glider is made from a fairly stiff sheet of ordinary writing paper, then one end is folded about 3 inches as shown. Now fold in half and cut to the shape shown by the dotted line.

When completed the reader should try various experiments such as throwing the glider upside down, spinning it around, or in fact any position at all and the glider will land right side up every time, showing that an aeroplane can be made absolutely stable.

The dotted lines across the tail flaps indicate where to bend in order to balance the machine.

(To be continued)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Now He Knows Who General Staff Is

A stranger hesitatingly walked into the War Department headquarters. He appeared embarrassed, swallowed hard a couple of times, and then said to Field Clerk A. J. Pitt:

"I would like some information. Can you tell me who this General Staff is that I've been reading so much about? I see his name almost as often as General Pershing's and I want to look him up in 'Who's Who.' I never heard of him before the war."

"General Staff is a brother to Corporal Punishment," replied Pitt.

"He is a cousin to Private Entrance," volunteered Clerk Frank Andreis.

Serious Predicament

Eager Lady—"But what if your engine stops in the air—what happens? Can't you get down?"

Aviator—"That's just what 'appens, mum. There's two Germans up over in France now with their engines stopped. They can't get down, so they're starving to death."—*California Pelican.*

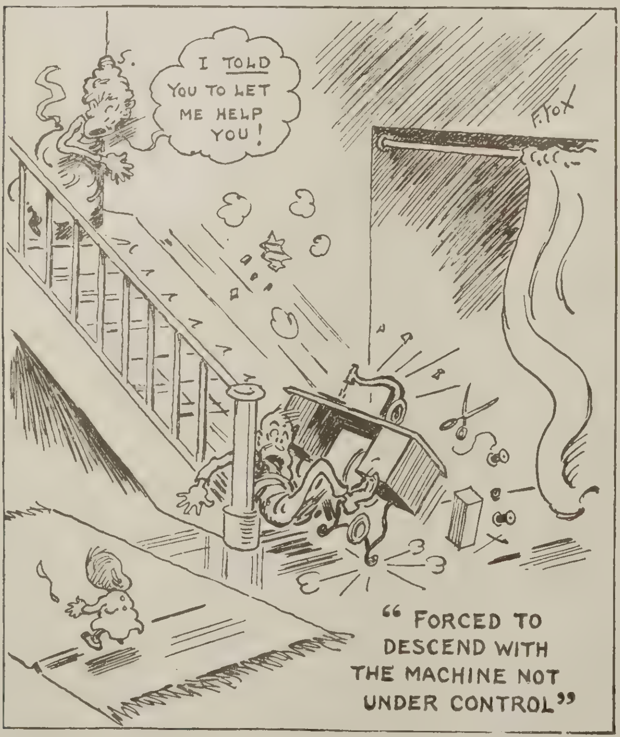
In Appreciation

By A. D. Pugh

Dedicated to Lieutenant Amos B. Emery and Jonathan H. Pugh, 28th Aero Squadron, A. E. F., France

May your head always work, your luck ever hold;
May always your plane be fully controlled,
May she never take fire or run out of grease,
Till the cows all come home, and the nations have peace;
May you dive through the clouds, and loop through the sky,
And not for a moment your motor quite die;
May you never fly up but that you fly down,
And never sideslip, banking close to the ground;
May you vanquish the Boche, and see the whole show,
And never, Oh never, your pancake be dough;
May your aim never err, your gun never jam,
And for Archies and bullets not caring a damn,
May you fly like the Eagle for freedom alone,
And always a victor return to the 'drome.

Illustrated War Phrases.


I TOLD YOU TO LET ME HELP YOU!
F. Fox
"FORCED TO DESCEND WITH THE MACHINE NOT UNDER CONTROL"

Courtesy Fontaine Fox and N. Y. "Evening Sun"

To a J. M. A.

(Apologies to Bryant)

Whither amid falling dew
While glow the heavens with bursting A.A. guns,
Far through its rosy depth dost thou pursue
The fleeing Black-Cross Huns?

Seekest thou he of the Masauran Lakes,
Or to strafe the Kaiser's hide;
Or where the iron crosses rise and sink
On Gen. Von Moltke's side?

Four hours thy planes have fanned
At that far height the cool thin atmosphere,
Volplaning now to the welcome land
Because the dark Hun is near.

But soon thy toil shall cease,
Soon shalt thou seek thy mail and mess,
And scream among thy fellows;
Brows bend no more now over thy chevron test.

Up in the Air

Mrs. O'Brien—Mrs. Murphy isn't washing to-day. I wonder what's the trouble?

Mrs. Rafferty—I understand that her son Tim took the clothesline and used it for a kite string.

At Early Dawn

From the great high tower, at early morn:
I see the sun come up at dawn,
I see the stars go home to bed.
I hear the sea gulls overhead;
And then the flag goes up:
Which means for men to fly.
I hear the purr of a motor, she's on the step,
Then like a bird the seaplane passes by.
Up, up like a swift winged swallow
Up, up into the big blue sky.
Still they come, still they follow,
Men like birds learning to fly.
Across the bay, the bay so blue
Up, up in the cloud like dew.
She looks so silvery, sparkles bright.
A spiral, a dip and then a glide,
Then she touches the water light.
All day long they come and go;
Each man takes his turn,
There is so much to learn.
A cross wind test: then up, up they go
To shoot the boat:
Within a hundred feet of its side.
Then she touches the water light,
Taxis about, across the tide
And back to the hangar for the night.

—*Elizabeth Ashmead Cantwell.*

(*Continued from page* 923)

Reed, John H.	KST
Regan, Harold	FRF
Rafeld, Max L.	AFO
Riebe, Herbert F.	FRF
Redmond, Forest H.	FRF
Reeves, Robert H., Jr.	FRF
Ruddell, Noel C.	FRF
Rabineau, Franklyn L.	WAC
Rombough, Miles D.	DIK
Ripperger, Clarence Wesley	SLR; CAF
Reynolds, Arnold R.	DIK
Ready, James B.	FRF
Rhoades, Otto V.	DIK
Ryan, Richard M.	FRF
Rogers, Frank W.	TFT
Robinson, Clarence A.	PFO
Ringer, Albert R.	FRF
Ranson, John W.	FRF
Relf, Richard	SLR
Rhoades, Horace L.	FRF
Rowe, Harold D.	LHV
Rourke, Frederick W.	EOT
Richards, Curtis D.	CWT
Renwick, William G.	FRF
Reckefus, Charles H.	FRF
Reeves, Robert H.	DIK
Redmond, Forest H.	DIK
Robertson, Charles B.	EOT
Rowe, Elmer C.	DIK
Royer, James A.	TFT
Ringland, James T.	EOT
Rooney, James R.	EOT
Royster, Royall H.	TFT
Ryan, Robert E.	BST
Robinson, Clark	TFT
Riebe, Herbert F.	DIK
Rich, Don O.	FRF; TFT
Read, James K.	EOT
Rogers, John P.	EOT
Riddlesbarger, Rufus	TFT
Robinson, Ralph R.	DIK
Ridlon, John R.	Note 7
Rierson, Thomas Palmer	SLR; Note 6

S

Stout, Samued C.	FRF; BST
Sanders, James O.	TFT
Schroeder, Rudolph W.	MDO
Seymour, Leland S.	FRF; DIK
Stephenson, James R.	DIK
Stout, Minor Woolfolk	SLR; RWT
Slater, Joseph Marsden	SLR; TFT
Sattler, Walter F.	DIK
Stewart, James David	SLR; AAD
Still, Leslie E.	FRF
Spier, James E.	FRF
Sloan, Harry	SLR; RWT
Snyder, Gerald S.	FRF
Scull, Leo N.	DIK
Swain, Francis W.	FRF
Sporlein, Louise Wolfgang	SLR; AAD
Sweeney, Raymond W.	TFT
Smith, Albert D.	SBI
Selts, William A.	DIK
Strahan, Donald P.	TFT
Sheehy, John F.	FRF
Sullivan, James L.	FRF
Shope, Leslie R.	DIK
Smith, Howard	CGC
Schuler, George F.	FRF
Summerfield, Vernon D.	FRF
Smith, Jerome T.	MAT
Smart, Oliver M.	PFO
Smith, Warner G.	PFO
Scherck, George	DIK
Smith, Edward L.	FRF; TFT
Stitt, Donald G.	TFT
Schmocker, Fred C.	FRF
Seaver, Lloyd Badger	SLR; PMT
Schroeder, John, Jr.	KST
Steele, Dudley M.	SBI
Skoning, John H.	DIK
Sain, Ben	FRF
Starbuck, Samuel T.	FRF
Swanson, Leonard F.	FRF
Sullivan, Denis Joseph	SLR; CAF
Stocking, Sidney S.	FRF
Spainhour, Carl Michael	SLR; PMT
Stuart, George Dayton	SLR; LDT
Swain, John D.	MAT
Silverman, Michael Mitchell	SLR; RWT
Schroyer, Malcolm E.	FRF
Surateux, John L.	FRF
Scott, Robert Chalk	DIK
Steele, James Jesse	DIK
Steedman, Charles R.	FRF
Smith, Cyril J.	PFO
Sullivan, Charles B.	DIK
Stegall, J. Rex	BST
Smith, Thomas J.	FRF
Shepard, Floyd W.	FRF
Simmons, Frank H.	FRF
Sears, Hugh A.	EOT
Starring, David S.	EOT
Schuler, Dement	GLC
Smith, Lowell R.	GLC
Shaw, James M.	EOT
Stoffer, Charles T.	EOT
Sparks, Walter Russell	SLR; LDT
Stutzman, Theodore B.	DIK
Scott, Neal J.	BST
Smith, Hart G.	DIK
Spang, Joseph P., Jr.	FRF
Smock, Harold E.	TFT
Schwartz, Charles W.	FRF
Savoye, Charles Ulysse	SLR; PFO
Spangler, Earl O.	DIK
Sargent, Carl A.	GLC
Sievering, Philip J.	GLC
Savage, Joe W.	WFO
Steel, John A.	WFO
Strother, Samuel P.	DIK
Smith, Harold D.	TFT
Shove, John D.	GLC
Schenck, John T.	LHV
Sanders, William C.	GLC
Simpson, George L.	BST
Sibbernsen, Albert H.	EOT
Symons, Thomas W., Jr.	FRF
Stryker, Walter William	SLR; PMT
Strattan, Abram G.	FRF
Shrader, Harlan L.	TFT
Smythe, Allen M.	TFT
Sherwood, Lyman W.	LHV
Sommer, George C.	ELA
Swain, Roland H.	EOT
Spencer, Vernon W.	PFO
Stinson, David R.	DIK
Soto, Earle	WFO
Saint Clair, Gordon C.	TFT
Searle, Piatt F.	WFO
Sharpe, Carl E.	WFO
Smith, Rallph Walter	SLR; Note 11
Smith, Kenneth W.	Note 14
Stembridge, Alfred R.	Not 5
Scott, William, Jr.	SLR; Note 6

T

Thornburg, David W.	FRF
Taylor, Howard S.	KST
Tinsley, George C.	FRF
Tenhope, Jerry J.	FRF
Tibbals, Earl B.	EOT
Teigen, Carl P.	MAT
Tower, Robert R.	FRF
Thomas, Charles B.	FRF; TFT
Thierbach, George Charles	SLR; RSD
Tuller, Maurice E.	TFT
Thomas, James R.	DIK
Tilton, James F.	FRF
Thompson, Herbert P.	TFT
Tabor, Paul	FRF
Thorne, Harold Wooster	TFT
Temple, Paul N.	FRF
Trewin, Harold R.	FRF
Trider, George H.	DIK
Taylor, Russell L.	DIK
Thorum, Elmer George	GLC
Turrill, Gardener S.	FRF
Ten Eyck, Charles A.	FRF
Thomas, William A.	PFO
Trezona, Lewis Rodda	SLR; LDT
Tompkins, Calvin, Jr.	GLC
Truscott, Arthur S.	WFO
Taylor, Frederick H.	GLC

V

Vandenberg, Byron F., Jr.	DMA
Vickery, James C.	FRF
VanderVoort, John M.	TFT
Van Veghten, Theodore S.	TFT
Von Derau, Ralph A.	WFO
Van Tine, Agnew Kennedy	SLR; PFO
Vance, Alfred W.	FRF
Vause, Norman J.	EOT
Vaden, Ferris E.	PFO
Van Dennis, William	Note 2

W

Weisbach, Arthur H.	TFT
Wages, Charles Sylvester	SLR; FSO
Wennerholm, Charles A.	VBW
Walker, Clyde LeGage	FRF
Wuchter, Stanley A.	FRF
Whitehead, Eugene C.	KST
Wooldridge, Henry E.	DIK
Warren, Edward W.	TFT
Webb, James E.	TFT
Wellford, Armstead L.	FRF
Whiteside, Rush S.	DIK
Walker, Ralph G.	FRF; BST
Wing, Charles R.	FRF
Wolf, Ninian L.	MAT
Wadsworth, Phileman T.	PFO
Wren, Samuel M.	DIK
Wing, Leo	FRF
Wallis, James C.	FRF
Wall, Edward B.	MAT
Walker, Franklin C.	DAP
Winter, Henry Clarence	SLR; RWT
Willrich, Edgar G.	SBI
Wallis, Edmund Crenshaw	SLR; CAF
Warde, Wilfrid B.	FRF; DIK
Wascher, Frank E.	KST
Walker, Henri D.	FRF
Weightman, John A.	TFT
Woodard, John D.	CWT
Weiser, Victor A.	LHV
Waltemate, Louie F., Jr.	FRF
Webb, James E.	FRF
Warren, Francis E.	WFO
Williams, Richard E.	WFO
Weinstein, Carl I.	EOT
Williamson, Cleburne M.	LHV
Walker, Albert K.	TFT
Williams, Edwin M.	FRF
Wine, Edward A.	WFO
Woodcock, William Irvin	SLR; PMT
Wiegman, John P.	FRF
Welles, Charles B.	FRF
Wheeler, Oliver P.	FRF
Waller, Lawrence J.	DIK
Westerhaus, Luther W.	TFT
Welch, Paul R.	TFT
Willson, Abner R.	SLR; GLC
Weiland, Stanley M.	Note 8

Y

Young, Joseph S.	MAT
Yerby, Walter T.	FRF
Young, Henry M.	DIK

Z

Zingermann, Ernest L.	FRF
Zettel, Raymond C.	DIK
Zender, Frederick A.	KST
Zanetti, Silvio	DIK
Zander, William E.	TFT
Zane, Robert T.	FRF

(*Continued from page* 911)

Liberty Motor Best in Europe, Says Sims

Washington.—Secretary Daniels authorizes this statement:

"Secretary Daniels has received a despatch from Vice-Admiral Sims stating that the recent tests of a seaplane equipped with the Liberty motor resulted in 'better performance as regards climbing and load carrying' than similar aeroplanes equipped with one of the best types of European engines. Admiral Sims says: The British expressed great confidence in the Liberty motor."

Aeroplane Catches Fire in Air, But Aviators Land Safely

Hartford, Conn.—Lieutenant F. H. Bentley of the Aviation Service, and his mechanician, Sergeant Harold Akins, had a thrilling experience while flying over Hartford when their aeroplane took fire while about 2,000 feet in the air. They landed uninjured, having put out the fire on the way down, before the machine had been seriously damaged. They were bound for Mineola, L. I.

Col. E. G. Buckner Speaks to Du Pont Employees

At the recent sales convention at Atlantic City, of E. I. du Pont, de Nemours & Co., Col. E. G. Buckner spoke to several hundred of the employees of the corporation. He spoke on the story of achievement which the present war had brought about in the industrial lines of the country. He presented a startling array of figures and gave a vast amount of inside information about the company's share in the war for civilization. He showed that though the work done by the company in supplying powder to the Allies has been credited more than once with having saved the British Empire, it was even more important to this country in that it laid the foundation on which rests a certain and adequate supply of explosives for our own boys "over there." He gave the credit to efficiency and organization and paid a compliment to the staff of the company for their faithful work.

New Aeroplane School

Mr. William Cook, consulting engineer, until lately with the Dewey Aeroplane Company, has established a training school and factory at Independence, Kansas. The Independence Aircraft Company, as the new concern is called, have secured a very favorable site. They have one military tractor on the field now and have two others almost completed. Mr. Cook, the manager, has as his chief instructor Elling O. Weeks, a licensed pilot who commenced flying back in 1909.

Wright-Martin Production 25 a Day

New York.—The Wright-Martin Airplane Corp. is reported to be producing engines at the rate of 25 a day, this being an increase of 5 a day over the production a month ago. It is expected that the new plant in Long Island City will be ready for operation soon and that production will be brought up to 50 engines a day before the end of the year.

Thomas

THOMAS-MORSE AIRCRAFT CORPORATION

ITHACA, N.Y. U. S. A.

Contractors to U. S. Government

Major Mitchel's and Gino's Funerals Impressive Ceremonies

NO feature of the funeral of Major Mitchel on July 11 was more impressive than the part taken in it by the twenty-three aeroplanes of the First Provisional Wing, from Mineola, under command of Major C. K. Rhinehardt, assisted by Major W. H. East, in charge of formation, and Lieutenant Frank D. Davidson, flag leader.

In three groups of six each the machines soared over lower Manhattan from City Hall to St. Patrick's Cathedral, their sides sparkling in the bright sunlight. Above these three groups at a height of 5,000 feet flew three reserve machines. In the event of any of the aeroplanes in the groups having to drop out of formation these reserve machines were to take their places in the line.

Persons throughout the city and the metropolitan district unable to go to Fifth Avenue to pay their respects to the dead watched the flight of the aeroplanes from windows, roofs, the streets and the parks. They felt that they were in reality a part of the great throng in actual attendance at the funeral. Perhaps, from this point of view, no funeral in New York was ever participated in by so many persons.

In the first division of six machines were Lieutenants Davidson, Kelleher, Reitenbaugh, King, Connell and Boyd; in the second, Lieutenants Welch, Sherman, Longstreet, Lockwood, Himman and Boggs; in the third, Lieutenants Roullot, Hump, Houser, Pierson, Henderson and Brokmeyer. The three aeroplanes that soared at a higher level were manned by Lieutenants Halley, Garrett and Krieger.

Besides these there were two other machines, manned by Lieutenants Carroll and Martin and Lieutenants Clark and Brenner, whose mission it was to fly here and there, dropping flowers, and then to proceed to Woodlawn Cemetery, to hover over the final service. It was from the machine occupied by Lieutenants Clark and Brenner that three clusters of American Beauties were dropped in front of St. Patrick's Cathedral.

After participating in the Cathedral ceremony the two machines went to Van Cortlandt Park, where they took on a fresh supply of fuel. Upon a prearranged signal they flew to Woodlawn Cemetery and dropped flowers onto the mourners gathered about the grave.

Two wagonloads of flowers were dropped on New York. They were furnished by Mr. and Mrs. Henry Payne Whitney, Mr. and Mrs. Payne Whitney, Mr. and Mrs. Robert Bacon, Mr. and Mrs. John S. Phipps, Mr. and Mrs. Charles Steele, Mr. and Mrs. E. D. Morgan and other residents in the vicinity of Mineola.

Sergeant Gianfelice Gino, noted Italian aviator, was buried on July 10th with high military honors. The fighting flyer, who won fame for his exploits above the battle lines in France, received the tribute of officers representing all the Allies. He was killed in an accident at Hazelhurst Field.

Solemn requiem mass was sung in the Church of Our Lady of Loretto in the presence of a large body of officers and flying men. Thirty officers from Hazelhurst Field and 200 cadets of the First Provisional Wings stood at attention when the body was carried to the hearse. Italian officers bearing the flags of Italy and the United States stood in line beside the hearse while the bands of the Forty-second and Forty-third Field Artillery regiments from Camp Mills played "Nearer, My God, to Thee."

As is the custom at military funerals on the battlefield, six aeroplanes with flyers who were the sergeant's personal friends escorted the body and dropped roses and other flowers from the air on the funeral procession. The procession started from Cornell's Morgue and was placed in a vault at Greenfield Cemetery to await removal to Italy.

The Italian officers present were General Tozzi, chief of the military branch of the Italian mission; Commandant Tritoni, representing the Italian Ambassador; Colonels Binda, Pancreti and Bonati; Captain Chippereli; Lieutenants Spinola, Bernati, Vezari, Cantoni and d'Amico. Lieutenant Testoni represented Sergeant Gino's family. Giani Caproni, designer of the Caproni aeroplanes, was represented by Captain d'Annuncio and Lieutenant Belloni.

Major General W. L. Kenly, director of the Bureau of Military Aeronautics of the War Department, was represented by Captain J. S. Fitch. Lieutenant A. L. Clarke appeared for Major C. K. Rhinehardt, commander of Hazelhurst Field.

The pallbearers were Lieutenants H. E. Watson, E. L. Williams and C. B. McCullough, of Hazelhurst Field, students under Sergeant Gino; Lieutenant Ferrand, of the French Instruction Corps; Captain James Watt, Royal Air Force of Great Britain, and Captain Zampagliane Artuso and Lieutenants d'Amico and Cansoni, of the Italian aviation service.

AERIAL AGE
WEEKLY

Vol. 7, No. 20 JULY 29, 1918 10 CENTS A COPY

Christening the aeroplane presented by the inhabitants of the City of Huddersfield, to the Canadian Government

NOTICE TO READER
When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
NO WRAPPING—NO ADDRESS
A. S. Burleson, Postmaster-General

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The Eagle's Wings

That Standard Production is a vital factor in giving wings of combat to our national bird, is a source of patriotic pride to the Standard Aircraft Corporation—"A Real Fighting Industry."

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Vol. VII NEW YORK, JULY 29, 1918 No. 20

AMERICA'S CONTRIBUTION TO VICTORY

AMERICA is beginning to contribute to victory.

Our contributions on land and sea up to three months ago were helpful; our recent contributions have proven to be of decisive value.

Aeronautically we have not contributed much outside of thousands of aviators, who are eager to complete their training and to do their share in beating the Hun.

But the outlook is now bright. The organizations gotten together by Major General William L. Kenly, Director of Military Aeronautics, and John D. Ryan, Director of Aircraft Production, are beginning to operate energetically and efficiently. Results are beginning to show, and we may look forward to real results in the very near future.

* * *

In the meantime American aviators are giving good accounts of themselves in France. Flying with the crack British and French aviators they give daily accounts of themselves and by their brave deeds spur us to greater efforts in the building of our Air Forces.

* * *

Our efforts must be very great indeed to meet the situation. It is not the question of hundreds of aeroplanes and motors but of thousands. And we must produce them and send them over without delay.

General Kenly's Good Work

The *Washington Times* pays a well deserved tribute to General Kenly. In a recent issue it printed the following article:

America's aircraft service is at last becoming a potential force in the war. This was admitted today by members of the Senate Committee which for two months has been investigating the air program. Planes now are being constructed rapidly, and they embody all of the improvements which experience on the other side has shown to be necessary.

According to the latest reports from the War Department, 450 American-built battleplanes had been sent abroad or delivered at ports for shipments on July 5, while on the same date 2,514 Liberty motors had been delivered ready for use.

Increases Efficiency

This increasing efficiency, the records show, is due to a great extent to the efficiency of Maj. Gen. William L. Kenly, brought back from France and detailed as chief of the air service. Kenly, with a wonderful record as an artillery officer behind him, made in the Philippines and in France, has put up-to-date methods in effect in the service. Among his innovations are:

Arranged to make it possible for all ground officers, attached to the aerial service, to learn to fly. This is believed preliminary to making it obligatory that officers attached to the air service shall in reality be flying officers.

Major Rice Back

Brought back from "over there" officers who have had actual flying experience in the face of the enemy to counsel with their colleagues here and advise how to get the best results. Those now here are Major Cushman A. Rice, who was in command of all of the American flying units on the British front during the battle of the Somme and the fourth German drive; Captain Cheute Johnson, of the Lafayette Escadrille; Captain Kelly, formerly of the Royal Flying Corps, now of the American army and Lieutenants Jones, Wilcox and Wells who were transferred from the Lafayette Escadrille to the American forces.

Cut away the red tape so that cadets detailed for instruction shall be given every opportunity to qualify as flyers without being unnecessarily held on the ground.

Eliminated Red Tape

General Kenly is building up here in Washington one of the strongest branches of the service. Through elimination of red tape he has succeeded in getting results that will prove beneficial in making the American aerial forces sufficiently strong to be a real factor overseas where the army experts now declare the war will be won in the air. His department also is co-operating in every way with the Senate investigating committee.

Major Rice has been detailed before that committee for the last week and members say that he has been of invaluable assistance to them.

He brought back from the other side the records of the British Flying Corps, which had been made available to him and which has cleared up for the committee many points left in dispute by previous witnesses. Having had actual battle experience and being at the present time under treatment for the effects of a severe gassing, Rice was able to explain to them, committee members say, just what was needed on the other side.

"His testimony has been most constructive throughout," committee members said, "and he has carefully avoided personal criticism. His story of the fighting was most thrilling, and he emphasized the close co-operation of the British and the Americans and the bravery with which the British met seemingly impossible situations. Major Rice has been of the greatest assistance to us at all times, because he is a veteran officer who know every angle in his busines."—*Washington Times.*

Enlarged snapshot of Colonel H. H. Arnold, Assistant to the Director of the Department of Military Aeronautics, and one of the veteran army aviators

Let Us Defeat the Germans in the Air

(Editorial in the *Outlook*)

The best way to silence the German artillery is to conquer the German air fleet. The aerial supremacy of the Allies enabled them to achieve their advance at the Somme. At once the whole German aeronautic department was reorganized, with the result that to-day in aerial strength the Germans appear to be equal to the Allies.

It is now for the United States to offset this balance of power, not in a small way, but overwhelmingly and by every means.

Hence we call attention to the appeal now being made by the Chief of the Bureau of Navigation to increase the number of engineers in the Naval Aviation Service. Applicants do not have to be graduate engineers. All that is asked is that they should be practical men, those who have managed garages or shops or who have been the bosses of repair gangs. Any further necessary training will be supplied by the Government. The age limit is forty-one years, but exceptions will be made where special skill or experience is shown.

Thus some of the men above the draft age who have been lamenting the fact that they cannot take an active part in the war have now a chance to prove the sincerity of their plaint.

Northcliffe Says Way to Victory is Through the Air

Viscount Northcliffe believes the way to Germany is "through the air." In an interview on July 23 he said:

"These American inventions were produced before Americans were engaged in the war. I am as confident, as I am in your capacity to produce large quantities of everything, that the American inventive faculty will produce results unexpected by the Germans. I am no believer in a thirty years' war, but I do believe that before this abomination is stamped out, and it must be finally stamped out, this tremendous conflagration will blaze for a long time yet—sufficient time to give American inventors an opportunity of showing their national genius for new things and new ways of doing things.

"I am still convinced, as I always have been since I introduced the American plane to the British public many years ago, of the vast importance of the aeroplane in warfare. The real road into Germany is above the ground and not along it. I believe that where today we have air machines in hundreds we shall have them in tens of thousands. The English speaking people are better fliers than the Germans. They have more dash and individual courage. The German is a fine flier in his squadrons and circuses, but he prefers the safety of night bombing to daylight work. You have the capacity to produce the engines and the wings in unlimited quantity, and I know that you will do it.

"The aeroplane is democracy's most effective war machine, and the great American automobile plants can make it in thousands and will do so."

From the New Plane News

Plane News, an aviation paper published by American Aviators in France, upon the occasion of a change in form, greets its readers thus:

> BON JOUR! friends, we greet you somewhat camouflaged, but you will no doubt recognize us in spite of our new "tailor made" appearance.
>
> The growth has been so rapid and the scope so broadened "Plane News" has been forced to provide better equipment to meet the demand.
>
> It is the same soldiers' paper, for the men of the Air Service, printing mostly air news—(not of the hot variety) which is of vital interest to all of us.
>
> Our policy remains the same—to do everything within our means to help win the war—by promoting the "Esprit de Corps" keeping up the spirits among all those we can, encouraging our pilots to get the hated Boche—*every one they go after,* and as the English say, "stick it, stick it by the gods until we win."

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

BY sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aero post service each, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M.		A. M.		A. M.		A. M.
G. P. O..	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq. ..	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times ...	10.40
D	10.20	O	10.35	Y	10.30	Tomp ...	9.40
F	10.30	P	10.20	College ..	10.05	Tremont .	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent..	10.55	Wash. ...	9.46
I	10.20	T	8.35	H. G. ...	10.00	W. F. ...	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only three cents (3c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making sixteen (16c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.

THE NEWS OF THE WEEK

The Government Aeroplane Corporation

Washington.—The new $100,000,000 Aircraft Corporation, the bill authorizing which, was signed by the President on July 10th, will be a Government Affair, a majority of the stock must be held by the Government.

According to Congressman Kahn, one of the chief objects of the corporation will be efficient division of spruce to the Allies. Great Britain takes eleven twenty-fourths, France one-sixth, Italy one-eighth, and the United States one-fourth of the output, and it is believed that the corporation should be organized, and each of the Allies put upon debentures of this Government for the amount of lumber they are receiving from it so that when the time of settlement arrives nations will get returns from their salvage in proportion to the stock they are allotted in the corporation. The United States Government will at all times be the majority stockholder, and the minority stock, it is proposed, will be sold to the various allied governments.

The corporation will to some extent purchase all the existing plants now manufacturing aircraft, but it is anticipated will in the main co-operate with existing plants rather than purchase them or build new ones.

The corporation, which will be under the control of the Aircraft Production Board, will be similar to the Emergency Fleet Corporation, and will function with regard to the production of aeroplanes as the Emergency Fleet Corporation operates in regard to building ships.

Congressional debate regarding this bill developed the fact that the Wright-Martin Co., Dayton, shipped 421 planes up to June 22, and sent out 36 carloads in one day from Dayton. Some of the congressmen, told by Congressman Kahn, that they were little "behind the time" endeavored to bring up the subject of the efficiency of the Liberty engine, and the results of the expenditures of the $640,000,000 appropriated last year for aeroplanes.

Aero Club Medals are Awarded to 33

Paris.—The Aero Club of America, through its Foreign Service Committee here, has awarded the medal of the organization to thirty-three aviators representing the United States, France, Great Britain, Italy and Belgium. The medal is of gold, elaborately engraved and is almost three inches wide. These are the aviators receiving the honor:

United States—Major Raoul Lufbery, L. Norman Barclay, Julian C. Biddle, Andrew C. Campbell, Oliver M. Chadwick, Victor Chapman, Edmund C. Genet, Ronald Hoskier, James McConnel, Douglas McMonagle, Norman Prince, Kiffen Y. Rockwell and Corpl. S. Walcott, all of whom have been killed, and Major William Thaw.

France—Capt. Guynemer, Lieut. Dorme, Adjutant Lenoir, Lieut. Chaput, all dead, and Lieut. Nungesser, Lieut. Garros, Lieut. Fonck, Capt. Herteaux, Lieut. Madon, Capt. Deullin, Capt. Pinsard and Sub-Lieut. Guerin.

Great Britain—Capt. Albert Ball, who is dead, and Capt. Fletcher Philip Fullard and Major William A. Bishop.

Italy—Lieut. Baracca, who is dead, and Sub-Lieut. Olivari and Major Piccio.

Belgium—Lieut. Thieffrey.

"Mitchel Field" to Be Name of Aero Camp

Mineola, L. I.—The name of Major John Purroy Mitchel will be given to a new aviation field just established two and a half miles southeast of Mineola, if a recommendation sent to the War Department by Major W. J. East, commander of the new field, is acted upon favorably. The idea is strongly favored by all officers of aviation fields on Long Island, including Major C. K. Rhinehardt, commander of Hazelhurst Field. Officers and men of the new flying school are already calling their training ground Mitchel Field. The field is part of old Camp Mills and of Hempstead Plains.

Need 20 Aeroplane Landings

Mineola, N. Y.—More than twenty landing places for aeroplanes are to be constructed at points on Long Island, provided wealthy landowners will donate the sites, according to Maj. T. K. Rhinehardt, commander of Hazelhurst Field. At present there are only three landing stations on the island besides Hazelhurst Field. They are located at Commack, Babylon and Central Park.

Powerful New Air Engine

Washington.—The Curtiss Aeroplane Company is endeavoring to develop an aeroplane with an engine of its own make said to be more powerful than the Liberty Motor. The Government is encouraging the Curtiss effort, as it appears likely to succeed.

Details of the new machine are withheld.

British Air Chief to Fly Out West

Washington—Brig.-Gen. Charles F. Lee, commanding the British aviation mission, assisted by Capts. J. J. Hammond, James Fitz Morris, W. A. Hannay and G. D. Hunter, will start on an aeroplane tour of the middle States, leaving Indianapolis about August 14, and will stop at sixteen of the principal middle Western cities to give exhibitions and lectures.

The total distance to be flown is approximately 2,500 miles. The purpose is to demonstrate what fighting in the air means. All of the British officers have seen active service in the war and besides doing military stunts in the air will point out in public talks the necessity for teaching advanced flying to our young aviators.

The itinerary will include air flights by at least three machines between Indianapolis, Cincinnati, Dayton, Columbus, Cleveland, Buffalo, Detroit, Toledo, Chicago, Milwaukee, Minneapolis, St. Paul, Des Moines, Omaha, Kansas City and St. Louis.

The planes used will be a Bristol fighter and a De Haviland fighting machine, both two seated planes, and two British Avro two seated training planes.

Lieut. Quentin Roosevelt, killed in action in France

Lieut. Quentin Roosevelt Killed in Action

A dispatch from Paris says German aviators have dropped a note into American aviation camps confirming the report of the death of Lieut. Quentin Roosevelt.

The message adds that young Roosevelt was buried with military honors by the Germans. The story of the fatal encounter, as told by the Wolff Bureau correspondent, follows:

"On Sunday, July 14, an American squadron of twelve battleplanes was trying to break through the German defense over the Marne. In the violent combat which ensued with seven German machines one American aviator stubbornly made repeated attacks. This culminated in a duel between him and a German non-commissioned officer, who, after a short fight, succeeded in getting good aim at his brave but inexperienced opponent, whose machine fell after a few shots near the village of Chambray, ten kilometers north of the Marne.

"His pocket case showed him to be Lieutenant Quentin Roosevelt of the aviation section of the United States Army. The personal belongings of the fallen airman are being carefully kept, with a view to sending them later to his relatives. The earthly remains of the brave young airman were buried with military honors by German airmen near Chambray at the spot where he fell."

Reports of the first fight state that the Germans appeared to be shooting at the lieutenant from the rear, the three machines being close together. Then one of the machines was seen tumbling through the clouds and a patrol which went in search of Lieutenant Roosevelt returned without a trace of him. He appeared to be fighting up to the last moment.

Lieut. Quentin Roosevelt, in April, 1917, joined the Royal Flying Corps to train for service with the American army. He was commissioned last fall and in the present spring began active service with the American air forces on the French front. On July 3 Lieutenant Roosevelt took part in an air battle between American and German machines in the Marne region, and on July 10 it was announced that he had brought down his first German aeroplane in a fight north of Chateau Thierry.

In this fight Lieutenant Roosevelt, with three other pilots, was eight miles inside the German lines when he became separated from his companions. Sighting three aeroplanes which he thought were those of his fellows, he started toward them and was close by when he saw he had been mistaken and that the aeroplanes were German. He opened fire and saw that after some fifty shots his tracer bullets had penetrated the fuselage of the nearest German plane. The machine went into a spinning nose dive and fell through the clouds 2,000 yards below. Lieutenant Roosevelt was certain that the enemy machine must have crashed.

Speaking of the death of Lieut. Roosevelt the New York *World* said:

"Noting with sorrow the death of Lieut. Quentin Roosevelt in the aviation service over the battle lines in France, the American people, paying deserved tribute to the valor of a heroic youth, will not fail to recognize also in his warrior career and tragic fate the instruction of a distinguished and self-sacrificing father.

There have been no mental reservations in Col. Roosevelt's eagerness for this conflict, the righteousness of which on our part he has powerfully advocated. He sought, mistakenly at his time of life, a part in the struggle, but the sincerity of his motives was proved when his sons, even to the youngest, offered themselves for service which was denied to him. A man thus represented in action has given hostages to country and to cause which never can be questioned.

Unless we misjudge the character of the former President, profound as is his loss and welcome as words of sympathy must be, pride rather than grief will dominate his spirit in this dark hour. Like thousands of other Americans, he has accepted the dread consequences of a necessary war, knowing their full meaning, and we shall find him in the presence of this personal affliction only the more determined to pursue the fight to a victorious conclusion.

Seaplanes Bomb U-Boat

Orleans, Mass.—A German submarine which appeared off the shore of Cape Cod at 10:30 A. M., July 21st, shelled and partly burned a tugboat and sank its tow of four barges by gunfire. Three of the barges were empty. The fourth was loaded with stone.

There were thirty-two persons on the tow, including three women, a young girl and two boys. All reached shore in small boats.

Three seaplanes from the Naval Aviation Station at Chatham, on the coast below here, attacked the U-boat with bombs, according to Rear Admiral Spencer S. Wood, Commander of the First Naval District. The fire was returned by the U-boat.

Navy Wants Photographs of Men Killed

Secretary Daniels requests that photographs of men of the Navy who have lost their lives in service against the enemy be sent to Recruiting Division, Bureau of Navigation, Navy Department, to be preserved in the Navy's records.

Secretary Daniels says: To perpetuate the memory of enlisted men of the Navy, lost during the war, photographs are now being carefully collected. As rapidly as these pictures are received, copies are made and the originals returned to the owners. A photograph of each man is then forwarded to the training station where he began his career in the service. There, a memorial gallery of honor or a hero's corner is formed so that for all time the faces of the men of the Navy who have made the supreme sacrifice may be honored by the youths of the future sent to the station for training.

Relatives of men who have been lost in the present war who have not received requests for pictures are asked to mail them to the Department for this memorial. All pictures should be securely wrapped after they have been marked with the name, branch of service, and training station the young man entered after enlistment. These should be addressed to the Recruiting Division, Bureau of Navigation, Navy Department, Washington, D. C. When copied, the photograph will be returned to the sender with one of the copies.

Technically Trained Wanted for Patent Office

July 15, 1918.

To the Editor of Aerial Age:

Will you kindly call attention through your columns to the need for technically trained persons for the examining corps of the Patent Office. Men or women are desired who have a scientific education, particularly in higher mathematics, chemistry, physics, and French or German, and who are not subject to the draft for military service. Engineering or teaching experience in addition to the above is valued. The entrance salary is $1,500.

Examinations for the position of assistant examiner are held frequently by the Civil Service Commission at many points in the United States. One is announced for August 21 and 22, 1918. Details of the examination, places of holding the same, etc., may be had upon application to the Civil Service Commission, Washington, D. C., or to this office.

Should the necessity therefor arise temporary appointments of qualified persons may be made pending their taking the Civil Service examination. Application for such appointment should be made to this office.

Very truly yours,
J. S. NEWTON,
Commissioner of Patents.

Mr. Benjamin Williams, of the Standard Aircraft Corporation, Elizabeth, N. J.

Army Appropriation Act Signed

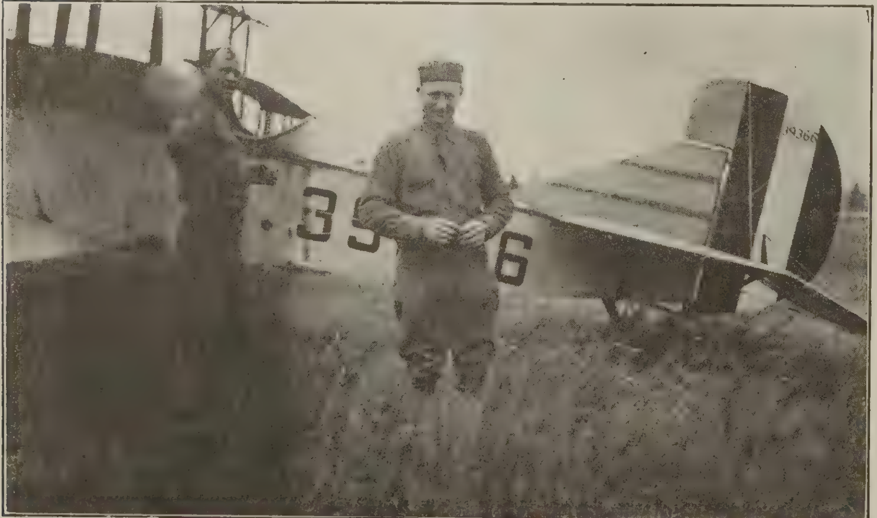
The President on July 10 signed the Army Appropriation Act, H.R. 12281, carrying a large number of new military laws. The appropriations total $12,085,000,000, an increase of $44,000,000 over the aggregate authorized by the House. The principal appropriations, all left unchanged, include ordnance and ammunition, $3,000,000,000; clothing, $1,230,000,000; machine guns, $575,000,000; armored motor cars, $347,000,000; transportation, $1,532,000,000; and aviation, $884,000,000.

That part of the act which applies to aviation is as follows:

Aircraft Production Corporation.—Under this heading is provided an appropriation of $100,000,000 for the purchase, manufacture and production and sale of aircraft, the United States at all times to be a majority stockholder.

Aviation.—The President is authorized to apportion and allot money for aviation purposes. College education shall not be necessary to qualify a cadet, pilot, military aviator, or other officer in the Aviation Service. Mileage, same as for officers and men, U. S. Army, is allowed for foreign instructors traveling in the U. S. on official business pertaining to aviation. Permitting sale of war supplies and plants for their production as heads of departments may deem expedient and the President direct.

Clerks, etc., for Aircraft Board.—$100,000 of the Aircraft Production appropriation shall be allotted for pay of necessary clerks and employees, rentals and office expenses.



One of the aeroplanes used for carrying the mail from Washington to New York. It is equipped with a Liberty Motor

Raymond Hitchcock Pays Tribute to Major Rice

A year ago he was a private. Last night at the Globe Theatre Raymond Hitchcock paid a tribute to Major Cushman Rice, who was in the audience. Fitting and coincident with yesterday's great victory. Mr. Hitchcock said, "Today the bells rang." And the audience cheered for many minutes. Soon we shall have cheering like the days of Manila and Santiago. Last night was one of these. And when he told of Major Rice's having been gassed and his eagerness to go back for more, there was more cheering. Wish Mr. Hitchcock had told that the unit commanded by Rice was cited for "invaluable aid," that he is here on an important mission, that he has lost sixty pounds "but ain't worrying."—*The New York Globe*, July 23.

Memorial to Major Mitchel, U. S. R., Late Mayor of the City of New York

The World suggests a great popular subscription for a suitable, worthy memorial to Major John Purroy Mitchel, U. S. R., Aviation Corps, for four years Mayor of New York City, by which the city, honoring a hero, will also honor itself. To this end *The World* subscribes $1,000.

The World, both morning and evening editions, will gladly receive and acknowledge contributions of any sum for this purpose.

All contributions should be addressed to the Mitchel Memorial Fund, *The World,* No. 63 Park Row, New York, N. Y.

A New Aviation Camp Paper

AERIAL AGE has great pleasure in welcoming to the aviation field the publication AIR SCOUT, the official publication of the aeronautical G. S. D. & C. Camp, which made its initial appearance a few weeks ago.

Lieut. Harry Lear, the editor, has gathered about him a capable staff, and from a perusal of the publication, seems to be building to a successful end. Special articles pertinent to aviation, several short aviation stories, up-to-date aviation news, a bit of delicious humor, some above the ordinary cartoons, and some excellent verse make up a very creditable magazine.

The third issue, which made its appearance on the 22nd, is even better than the previous two issues. One of the short poems contained therein is given herewith which speaks about the parade of the American troops in London in June, 1918, and hits it off particularly well to the man who can visualize the London attitude toward American troops. The poem is written by George Trevor.

"Bobbing miles of jaunty stetsons,
"Western sun-baked bronze complexions,
"Rifles sloped in all directions—
Solemn looking blokes!"

"Moving files of khaki knickers,
"Bandoliers and rolled-up slickers,
"Glinting barrels—bayonet flickers—
Solemn looking blokes!"

"Lean of jaw and lithe of muscle,
"Crammed with Yankee pep and bustle,
"Ready for a desperate tussle—
Solemn looking blokes!"

"Swinging stride in carefree manner—
"Massachusetts, Indiana—
"Marching 'neath your starry banner—
Solemn looking blokes!"

Tangents of Observation

The following letter received by "Aerial Age" explains itself:

Editor of "Aerial Age,"
New York, N. Y.

Dear Sir:

As a reader of "Aerial Age" I was interested in recent proposals to fly aeroplanes across the Atlantic. I noted it was suggested to fly at an altitude of about 10,000 ft., and that the Azores could be sighted at a distance of about 100 miles.

I thought it might be interesting to calculate the tangents of observation, on the water's edge, for different altitudes of aeroplanes and give them in the following table of altitudes from ¼ mile to 6 miles—the latter being not far from record altitude which I understand is about 29,000 ft.

Aeroplane Altitude	Observation Tangent
¼ mile..... 1,320 feet	44.3 miles
½ mile..... 2,640 feet	62.7 miles
1 mile..... 5,280 feet	88.6 miles
2 miles....10,560 feet	126.1 miles
3 miles....15,840 feet	154.3 miles
4 miles....21,120 feet	178.0 miles
5 miles....26,400 feet	199.3 miles
6 miles....31,680 feet	217.8 miles

As the earth is an oblate spheroid I have adopted an average of diameters through poles and Equator of 7,913 miles for making calculations.

Yours truly,
A. L. McT.

American Official Communiques on Operations of U. S. Aerial Forces

July 9, 1918.

In the Chateau Thierry region about noon a German patrol of five machines was attacked and driven off by five of our planes.

In the Colmar sector our anti-aircraft batteries were active against the German air forces. Three German propaganda balloons were released.

July 11, 1918.

As a result of a bombing expedition last evening, five of our machines are missing. One of our planes brought down an enemy observation balloon.

July 12, 1918.

Yesterday our aviators shot down a hostile machine in the region of Thiaucourt.

The sector was very quiet on July 9. We drove off four of the enemy's planes. Our patrols were active.

The German aeroplane reported shot down in the American Official Communique number 59, Section A, was brought down July 11 near Thiaucourt by Lieuts. Jones and Tobin. As result of their fire the German plane fell in flames.

July 13, 1918.

Section B.—In the Chateau Thierry region, July 10, few German aeroplanes were in operation. A patrol of 8 German planes attacked an American photographic mission at 8 o'clock in the morning 7 kilometers behind the German lincs.

In the Marne sector, July 11, moderate activity continued. German aeroplanes were fairly active, but balloons were very quiet.

In the Thann sector, on July 11, German aeroplanes were unusually active for this sector.

In the Altkirch sector, on July 11, there was no unusual activity except numerous hostile aeroplanes. Of these, two attacked an American balloon, but were driven off by two French planes.

July 17, 1918.

Yesterday, in the region of Thiaucourt, a hostile aeroplane was shot down by one of our aviators.

The statement on aviation for July 20th says:

"Our airmen in collaboration with British squadrons continued their work along the whole battle front. Twenty German machines were brought down or put out of commission by our pilots, and two captive balloons were burned. The British airmen destroyed seven German machines.

"Our bombing groups continued their expeditions against the crossings of the Marne. A foot-bridge west of Reuil was bombed and demolished. Cantonments and troop concentrations at Oulchy-Le Chateau, in the Vauxbuin Ravine, at Fere-en-Tardenois and in the region of Oeuilly were attacked with machine guns or bombs, the troops being dispersed. Stations in the rear areas were sprinkled with projectiles. Fires broke out in the stations at Amifontaine and Fismes. Heavy explosions were observed at Pontavert. Twenty-two tons of bombs were also utilized in the day and twenty-one the following night.

"British squadrons dropped two tons and a half of explosives with excellent results."

Press Dispatches about American Aviators

With the American Army on the Marne.—Five German aeroplanes, modelled after the machines the American aviators are using and carrying American insignia on the wings, attacked one of the American sausages south of Chateau Thierry on July 15, and managed to get so close under the disguise that they were able to fire incendiary bullets into the balloon, which burst into flames. The occupants of the sausage, however, escaped by parachutes.

Seventeen American pursuit planes immediately left the ground, and when last seen they all were fighting well inside the enemy lines.

Paris. Lieut. W. Vernon Booth, Jr., of the American Flying Corps, has died at a Scottish hospital near the front from injuries received when he was forced to land after an aerial combat over the German lines. The injury necessitated the amputation of a leg. He was buried with full military honors.

With the American Army on the Marne.—In one of the dozen air combats which took place on July 16, P. J. Abersphy of Maine shot down an enemy machine fifteen miles north of Dormans. Soon afterward George Robertson of Kansas City brought down a German plane within the American lines in the same sector.

From the opening of the battle our aviators took an active part, especially on the Marne. Despite the thick curtain of smoke which concealed the bridges thrown over by the enemy our squadrons discovered and attacked them, flying at a low altitude. They destroyed two bridges filled with troops, which were precipitated into the river. Attacks by machine guns and bombs were carried out on convoys and columns debouching on the north bank of the Marne. Our escadrilles engaged enemy aviators during the battle with good results. Forty-one aeroplanes were brought down or put out of action and nine captive balloons were set afire.

With the American Army in France.—Three German machines were brought down on July 17 by American aviators in the Toul sector.

Eugene Jones of Chicago and A. G. Tobin of San Antonio, Texas, while protecting a squadron of observation machines, encountered six German aeroplanes near Thiacourt. They promptly attacked the enemy. Tobin sent one down in flames and then engaged another, which he sent crashing to the earth.

First Lieutenant David E. Putnam of Newton. Mass., also shot down an enemy aeroplane. This is the eleventh enemy machine credited to Lieut. Putnam.

Charles J. Biddle of Andalusia, Penn., an American pilot, attacked two enemy two-seater machines over the German lines. He probably downed one of them, but was wounded. Losing sense of direction in the fight, he succeeded in landing between the American and German lines and regained the Allied trenches after taking refuge in a shell hole.

Christopher Ford of New York City has brought down his second enemy machine.

Frank O. D. Hunter attacked an enemy two-seater and was wounded. Although blinded with blood, he succeeded in bringing his machine to earth.

George Turnure of Lenox, Mass., downed a sausage balloon after three unsuccessful attempts, scoring his third aerial victory.

Notable work has been done by the allied aviators during the progress of the new German offensive. The bombarding, observation, and battleplanes have been constantly busy, and the mastery of the air has been maintained throughout.

The air forces constantly harassed the attacking columns of the enemy, and supplied information from moment to moment to the French Staff regarding the movements of the Germans. Numerous concentrations of German troops were spotted, thus enabling the artillery to disperse or destroy them.

The air forces likewise took an effective part in the actual fighting with their machine guns and aerial torpedoes.

Six American citations appear in the official French journal. Two of these make mention of Lieut. Paul F. Baer, of Mobile, United States Flying Corps, praising "his remarkable audacity in making six flights in one day and bringing down two Germans. The second citation, dated June 4, says:

"Lieut. Baer brought down his eighth enemy aeroplane and did not hesitate the next day to attack within the enemy lines a patrol of superior numbers, with which he engaged in a fierce combat from which he did not return."

Lieut. Baer was reported missing early in June. Since then it has been officially announced that he was a prisoner in a German camp.

Five of Our Flyers Now Rank as Aces

Paris.—Among many American flyers who have continued to distinguish themselves on the western front fire have attained the rank of aviation aces. This means they have destroyed five or more enemy machines, the latter falling inside the French lines.

Sergt. D. Putman has shot down nine. Major William Thaw, formerly second in command of the Lafayette Escadrille, has accounted for five enemy machines, as well as Sergt. Edwin Parsons and Capt. David Peterson, both members of the one time Lafayette Escadrille.

Lieut. Douglas Campbell has also shot down five machines. The scores of other American pilots have accounted for many enemy machines, but none of them has yet brought down five that are officially confirmed.

Picked Up at Sea and Landed Safe at Port

Ensigns Briscoe and Griffin, and Chief Machinist's Mate Upton were safely brought to port July 24, the Navy Department announced, by a Swedish vessel, which picked them up at sea Sunday, after the airship in which they were making a flight was disabled.

The port at which the men were landed was not named, but it is assumed these were the naval men reported last night in press dispatches as having been landed at Nova Scotia. The men were operating a naval dirigible.

Mrs. Clio Bracken, the noted sculptress, has made a very artistic statuette of Lieutenant Henri Farré, the famous French artist.

It stands 16 inches high and is an exact reproduction of Lieutenant Farré.

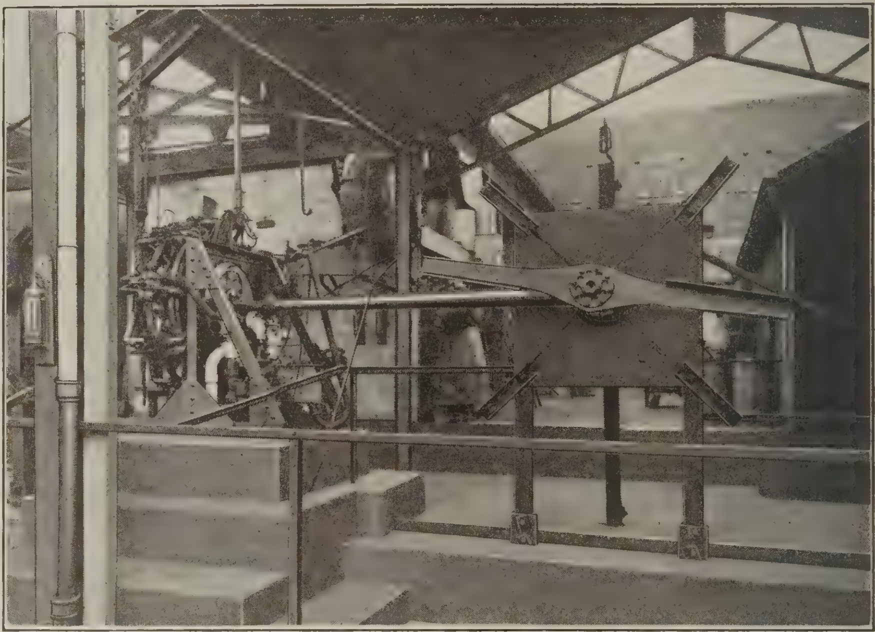
Famous Artiste Makes Statuette of Lieutenant Farré

Replicas of Lieutenant Farré's statuettes can be obtained from the Aeronautic Library, 280 Madison Avenue, New York City.

There are two kinds made, the bronze finish, the price of which is $15, and the ivorized, the price of which is $10.

They make an artistic and attractive piece for the office, the drawing room and den.

The AIRCRAFT
TRADE REVIEW



The great French aeroplane factory at Salmson. Shops of magnetos, where motors are tested

C. W. Nash Aid to Aircraft Production Director

The War Department authorizes the following statement from the Bureau of Aircraft Production:

C. W. Nash, president of the Nash Motors Co., of Kenosha, Wis., and formerly president of the General Motors Co., a well-known executive in the motor industry, has been appointed by John D. Ryan, director of aircraft production, as assistant to the director in charge of engineering and production.

Mr. Nash will assume his duties immediately, having given up for the duration of the war his active connection with his own corporation.

This appointment does not change in any way the organization already effected in the Bureau of Aircraft Production except to give Mr. Ryan an additional assistant in charge of the important work of engineering and production.

Norse Countries Buy Dutch Inventor's Motor

Copenhagen.—The Dutch inventor Ellehammer recently sold his patent rights in a new motor engine to Norway and Sweden.

The sum he received is reported to be greater than has ever been paid in Scandinavia for an invention.

The feature of the new motor is steam. It is claimed that it will supersede the ordinary explosion engine, that it is neither heavier nor bulkier than the benzine motor in common use, and can use the cheapest raw oils.

American Bronze Corp. Builds Big Addition

Owing to the great increase in the demand for Non-Gran Bearing Bronze, the sole product of the American Bronze Corporation at Berwyn, Pennsylvania, a large addition to their works has been constructed in record time by Crowell, Lundoff and Little of Cleveland which will be finished August 1st. This fine new plant of the latest type of fire-proof factory construction will triple their present capacity for this product by September 1st and enable them to take care of their customers' orders promptly.

These new buildings have been carefully planned to give the utmost efficiency of production. The material moves by the shortest routes in practically a straight line from the receiving stores department to the shipping department and modern labor saving devices reduce waste of effort to a minimum.

Personal Pars

Ralph A. D. Preston, who has been in charge of the flying field of the Goodyear Tire & Rubber Co., near Akron, Ohio, where instruction in balloon service is given to student officers of the army and navy, has received his commission as lieutenant, senior grade, in the United States Naval Reserve Flying Corps. He is stationed at Washington, where he is in charge of repairs on navy airships.

Overland Factory Being Enlarged

Toledo.—The Willys-Overland Co. is building additions costing $307,430 to its Toledo plant. The largest addition is to be a 300-foot, one-story structure, costing $225,000, to be fitted as a machine shop for making 8-inch shells, under a new contract recently awarded the company. Other additions are a boiler room, costing $65,430, and an extension to one of the factory offices at a cost of $15,000. All have been necessitated by the large demands upon the company by the Government.

Motor assembly shops in the Salmson works in France. French Official Photo

Plenty of Gasoline If Not Wasted

Plainfield, N. J.—The Wright-Martin Aircraft Corp., Long Island City, has purchased the Plainfield (N. J.) plant of the Bosch Magneto Co. The plant has not been used for some little time. It is not stated for what purpose Wright-Martin will use it.

Goodyear Makes Changes

The Goodyear Tire & Rubber Company, Akron, Ohio, is announcing the following changes in branch managers:

L. C. Alexander, formerly supervisor of salesmen for the Indianapolis district, has been appointed manager at Cincinnati, succeeding E. G. Shick, promoted to the Automobile Tire Department at Akron.

J. S. Taylor, formerly sales supervisor of the Southern district, is now manager at Jacksonville, Florida, succeeding J. J. Kendall, now in the Federal service.

H. C. Davies is acting branch manager at Dallas, Texas, replacing R. S. Brace, now in the Federal service.

J. M. Dine, formerly branch manager at Omaha, Neb., is now assistant manager at the Chicago branch.

C. A. Cramer, formerly manager at Cedar Rapids, has succeeded Mr. Dine at Omaha.

E. L. Luthey has been promoted from supervisor of sales at Chicago, to branch manager at Cedar Rapids, Iowa.

Marmon and Hall Going to France

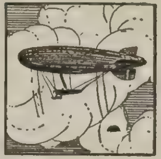
Detroit.—Major Howard Marmon, Colonel Hall and Charles H. Willard, chief engineer of the Aeromarine Plane & Motor Co., will form a Government commission to obtain the latest military information on aircraft. They will leave shortly for France and England.

Many Jobs for Women Workers

Washington.—Women are packing parts, stuffing bags with excelsior, working on wire parts, cutting copper pieces, binding wires with tape, and soldering joints of wire, applying "dope" and painting the United States Emblem on the bodies of the aeroplanes in aeroplane factories, according to a report made by the Women's Committee, Council of National Defense. They are also doing light carpentering and metal work, and sew linen on the wings.

Major B. H. Gitchel has been appointed chairman of the industrial relations section of the Aircraft Production Board, succeeding C. P. Neill. Major Gitchel is at present assistant in the office of the Secretary of War. Mr. Neill becomes chairman of the Railway Board of Adjustment No. 2.

MILITARY AEROSTATICS



By Lieut. H. K. Black, R. F. C., C. F. A.

THE science of Aerostatics, or, in plain English, Ballooning, is a closed book to the very great majority of people. Particularly is this true of captive ballooning as it is carried on in France today. The theory of ballooning has been known a great deal longer than the theory of flight with a heavier-than-air machine. The Mongolfier Brothers established the fact practically years ago that an envelope filled with a gas lighter than air, in their case it was air rarified by heat, would rise. Balloons were first used successfully and to any extent in war by the French during the siege of Paris. There, however, they were used to get messages out of the city by floating over the heads of their enemies.

In the Civil War spherical balloons were used for observation purposes, and from the accounts of their actions were successful to a certain extent. The spherical balloon, however, could not successfully battle with the wind when it was held captive by a cable, and out of the spherical idea there came the kite balloon. These were used in the present war by both sides, and carried on their work under very pronounced disadvantages of wind and weather. On one occasion, at least, they demonstrated their worth. A kite balloon stayed in the air for twenty-nine hours at a time, being the only communication available with the fighting front, when, in a severe battle, all communications were destroyed.

This occasion drew the kite balloons into the official eye of the Army, and the tremendous progress which had been made up to the present practically dates from that occasion.

The theory of ballooning is, as I said above, fairly well known among a few laymen, not connected with the Armies. Ballooning as it is carried on in France now is known to only a select few and hardly to one who is not in the service.

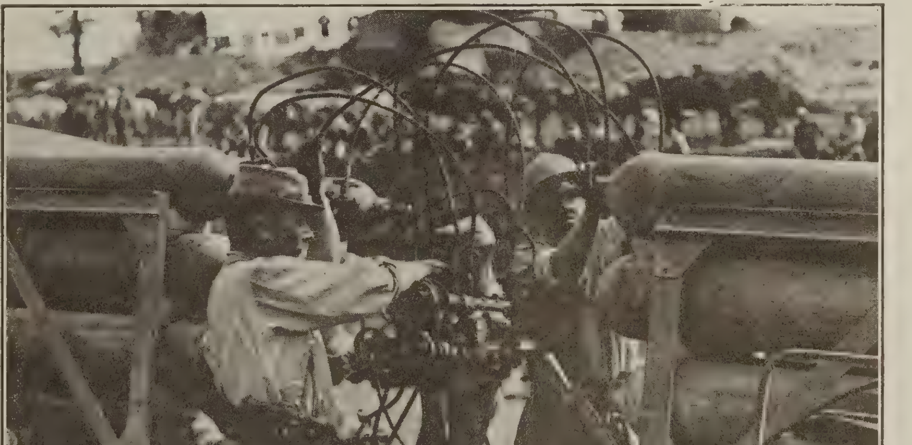
The importance of the balloon for observation purposes is not appreciated nearly enough even now, for owing to the novelty of the aeroplane the easily seen advantages of a present day observation balloon, in so far as observation is concerned, are almost entirely overlooked.

In this column, therefore, will appear from time to time a more or less connected series of articles dealing with the uses, handling, and advantages of the military observation balloon as used today by the Allied Forces in France, showing the immense strides which have been made in balloon practice as the result of experience in the present war.

There are certain things and practices, used by the Allies, which as yet the Huns have not found out. These things they will not learn from these pages. The articles appearing herewith, however, will be authoritative in as much as is possible, bearing in mind the well known long ears of our enemies, and the constant minor and detailed changes which are occurring in the actual work in France as the result of later experience.

The author has had rather lengthy experience, as experience in the Air Force goes at present, with the balloons on the Western Front, and speaks from the knowledge acquired therefrom.

The kite balloon proper, that is, a balloon which flies at an angle to the wind, and is supported, to some extent, by the pressure of the wind on its under surface, the same as a kite, was invented by a German captain by the name of Drachen. This balloon is used to a great extent by the Germans today. A French officer improved on it, and the present balloon used is the re-improved Cacquot balloon, which he first used.



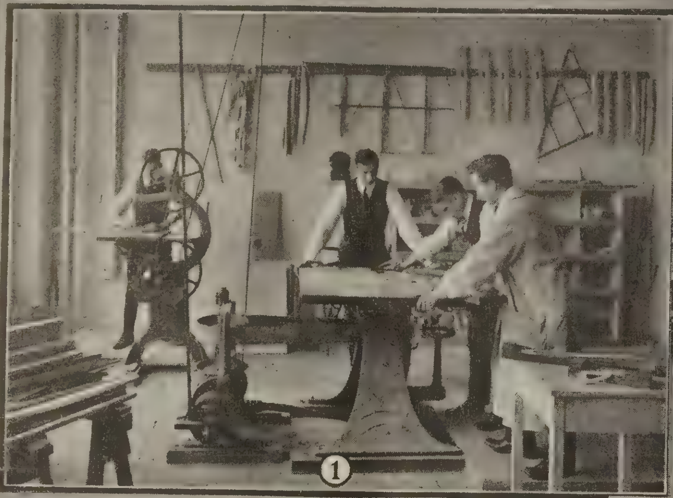
The hydrogen bottles used for inflating the observation balloons. The hydrogen in these tanks is under great compression. Armored hose is attached as shown which empty into a flexible twelve inch pipe, which fills the balloon. The sudden expansion of the gas as it escapes from the tanks very often freezes the taps, and the tanks and hose become coated in ice even in the hottest day in summer. It takes nearly 200 of these tanks to fill a balloon.—French official

Up until the opening months of 1917 the British balloon wings were using the Drachen balloon. About this time they gradually changed to the Cacquot type and are still using them. They are a great improvement over the Drachen type and have been adopted by the United States. This type is superior in several ways. They can ride out a much greater wind than the Drachen. According to a German text book which I have been privileged to see, the Drachen was not supposed to ride out a wind stronger than twenty-five miles per hour. I have been in a Drachen in a thirty-five mile wind, and it was distinctly uncomfortable, while with that wind all chance of doing decent observing was out of the question. The Cacquot has ridden out fifty-five miles of wind and observation was not impossible. The chief difference in principle of the Cacquot lies in the fact that it is a streamline balloon. It is built on the streamline shape, and by being so built it rides almost horizontally in the air. It rides up into the wind and consequently does not put half the strain on the cable which the Drachen would. This is the reason it can ride out a heavier wind. The Cacquot is a much steadier balloon any way, and much better work can be done from it. The only disadvantage the Cacquot has is its tendency to nose-dive when being hauled down in a strong wind. Cases have been known where a Cacquot has dived completely to the ground from considerable height. It is not by any means a common occurrence, however.

The Cacquot has, of course, owing to its streamline principle, no tail parachutes, that long string of cups which was the chief characteristic of the Drachen. This fact accounts to a great extent for the lessening of strain on the cable. It has, in place of the tail parachutes, two longitudinal fins, which, placed toward the stern at an angle of about forty-five degrees from the vertical fill with air from the wind scoop in the rudder, and with the rudder keep the balloon head on to the wind.

(To be continued)

THE WEST SIDE Y. M. C. A. AND THEIR AEROPLANE COURSE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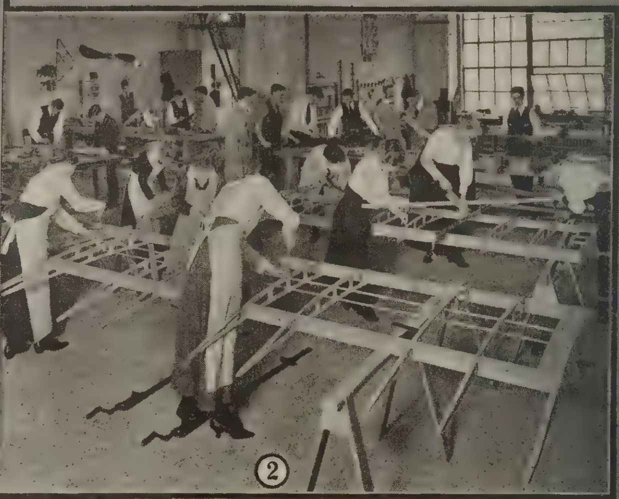
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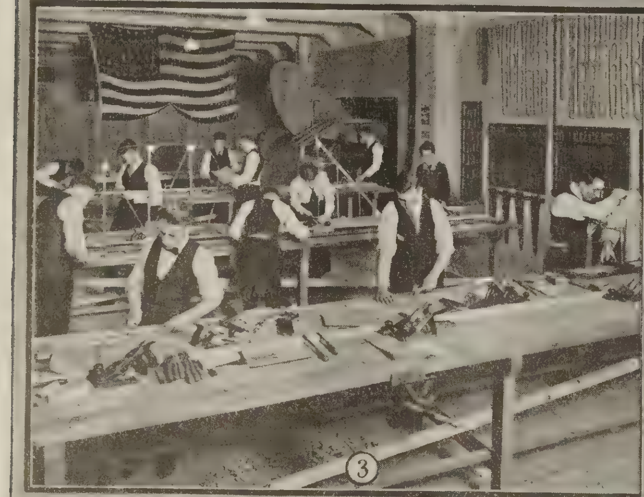
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THE WEST SIDE Y. M. C. A. AEROPLANE COURSE.

Nos. 1, 2, 3, 4 and 7—Factory course, woodworking. No. 8—Field course, aeroplane assembly.

No. 6—Factory course, metal work.
No. 10—Field course, motor assembly.

No. 9—Field course, aeroplane assembly.
No. 11—Motor assembly, field work.

Speed Production of Spruce Lumber

Spruce, which is the most desirable timber for the construction of aeroplanes, is recognized as essential in the winning of the war, and arrangements have been made for greatly increasing the production in Oregon and Washington, regarded as the two principal states from which spruce lumber is obtained. From ten to thirty billion feet of spruce a month is the aim of the Spruce Division of the United States Army, which has headquarters at Portland, Ore., the center of the great spruce area of the Pacific Northwest. The production of spruce in those states has recently been speeded up to a remarkable degree.

There are now from 14,000 to 16,000 men engaged in the forests of Oregon and Washington, in the cut-up mills, and in the traffic department preparing the raw stock and semi-finished spruce products for the great aeroplane manufacturers of the country, and for shipment to our allies. The number will very shortly be increased to 30,000. Vast equipment has been assembled to handle this great work. Mills have been built, scores of donkey engines have been placed where needed, steel cable is being employd in such quantities that other lines of industrial activity have difficulty in obtaining sufficient quantities for their requirements. After the spruce has gone through various preliminary operations it must be dried, and for this branch of the work two score large dry kilns have been erected, and it is now proposed to increase the number of kilns to 124 units.

Although the production of spruce in the Pacific Northwest has recently been increased 700 per cent, preparations have been made for an increase of 300 to 400 per cent over the present enormous output. It is said that Great Britain and France alone can consume in aeroplane construction practically all the spruce produced in the Pacific Northwest today, hence the plans for increasing the production, as the demands of the United States as well as those of our allies must be met.

11,000,000,000 Feet in Two States

Methods almost revolutionary in character were adopted in spruce production, when the United States entered the war, on account of the sudden demand for spruce lumber. Some features of the scheme of production were experimental, and while meeting the emergency for the time being, later were abandoned entirely or were recast better to meet requirements. The system of "riving" was adopted in the Pacific Northwest, and at first met with much criticism because it was claimed that there was too much waste. It now appears that while there is an apparent waste there is no actual waste for the reason that unused slabs from the riving camps will be gathered up and turned to useful account. But riving is said to have served a great purpose; it produced more quickly the desired quantity of spruce for our aeroplane production; it resulted in the saving of space on freight cars, and it produced in rough form just that quality of spruce which must be utilized in aeroplane construction.

Aeroplanes can be made of pine, hemlock and fir, but according to the best authorities on the subject none will measure up to spruce. A Liberty motor, it is said, will drive a two-seated Dehaviland aeroplane 147 miles an hour if it is made up of spruce, while if the machine is built of the other materials mentioned, the speed will be reduced in proportion to the extra weight. Spruce, therefore, is regarded as essential. In addition to that quality of lightness, strength, and resiliency it will not fracture when struck by a bullet.

The known stands of spruce timber in Oregon and Washington are estimated at 11,000,000,000 feet. Great care is exercised in the selection of spruce for aeroplanes, the selective system being adopted. Comparatively little of the stands are readily accessible to transportation, and it was found necessary not only to build wagon roads, but actually to enter upon an extensive system of railroad construction. The large stands of spruce where the percentage of quality runs high average about thirty miles from railroad lines, so five railroads into the spruce belts are in operation or being constructed, and it is expected that by next Winter this tremendous effort will supplement the present operations to such an extent that the supply of spruce will more than exceed the requirements of the United States and her allies.

In April 10 per cent of the spruce production in the Pacific Northwest was sent to American factories, and 90 per cent to Europe. In May 30 per cent went to American factories and 70 per cent to Europe. However, from now on American factories' requirements will mount, and the quantity going to Europe cannot be reduced, so it means that the production of spruce has got to be increased.

While spruce is bringing a big price in the Pacific Northwest, it is estimated that the cost of aeroplanes is affected but slightly on account of the high price paid for the lumber. Before the Government took charge of the production spruce was selling for $250 a thousand feet, and it is said that not half of it was fit to go into aeroplanes. Now the best is being obtained, and with practically no increase in cost. Under Government direction waste has been reduced to a minimum.—New York Times.

Major Cushman A. Rice at Press Club

Major Cushman A. Rice, who has but recently returned from the French and English fronts, gave an interesting and highly instructive discourse on his experiences in aerial combat "over there" at the National Press Club.

Major Rice had exceptional opportunities of witnessing aerial combats, having participated in more than thirty during his short stay in France.

Aviatrix to Carry Aero Mail

According to a press dispatch from Paris the name of the flier who will carry the aero mail from Paris to London has just been announced. The pilot of the machine is to be a woman, Mme. Decorne, noted in peace time as a flier member of the French Women's Seagull Club. While France boasts many women fliers, Mme. Decorne will be the first to enter the flying service of her country since the beginning of the war.

Of course, previous to this, mail has been carried by aeroplane from Paris to London. Experimental flights were made by two French aviators, Heraldy and Lorgnat, with a view to the establishment of a daily aero mail service between the two cities, and during those flights they carried about six hundredweight of mail matter.

Zeebrugge Blocked Again

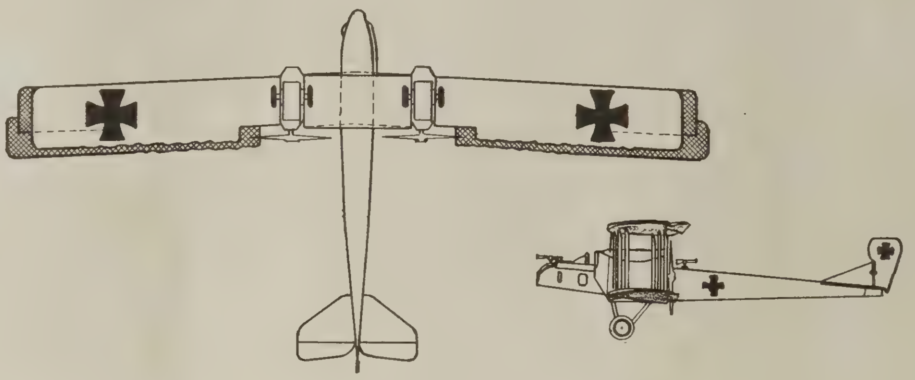
Amsterdam—Repairs which the Germans had made to the mole at Zeebrugge and the locks there have again been destroyed by Allied airmen, according to the Telegraaf. Two torpedo boats have been sunk in the harbor, it adds, and the canal remains closed. The German observation tower at Lisseweghe was also hit by the airmen.

Many casualties among the marines at this naval base and among the civilians are reported. Lissewegne has been partly evacuated, but thousands of men from Heyst, Blackenburghe, Zeebrugge, and Ghent have been forced to work in the neighborhood and on the mole.

American Seaplanes Guard Large Area Off English Coast

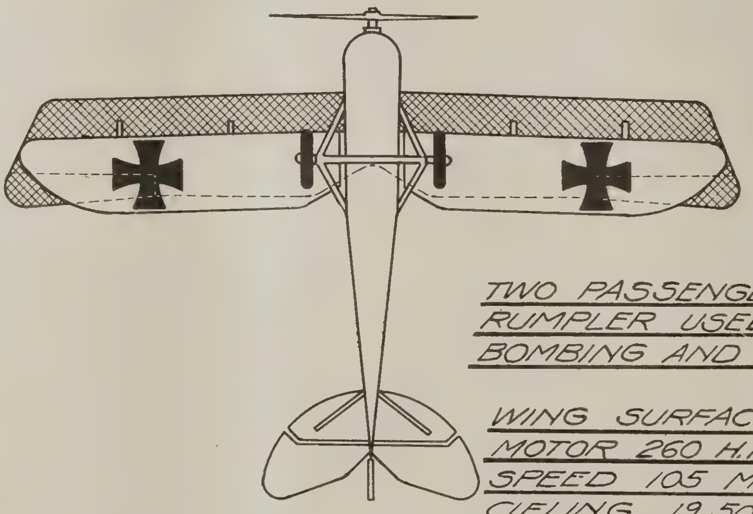
American aviators have taken over from the British one of the most important seaplane stations on the English coast, from which they will do continuous patrol duty over a large area of the sea.

The American aviators stationed on the English coast have heretofore been working as part of the British squadrons, and this is the first purely American station in England.



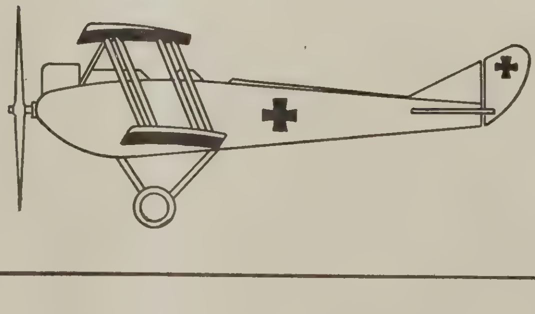
THREE PASSENGER TWO MOTORED 1917
GOTHA BOMBER.

WING SURFACE 1023 SQ. FT.
HORSE POWER 520
EQUIPMENT 5 BOMBS WEIGHING ABOUT 1325 LBS.
3 MACHINE GUNS.
ELECTRIC SEARCH-LIGHT.



TWO PASSENGER 1917
RUMPLER USED FOR FIGHTING
BOMBING AND PHOTOGRAPHY.

WING SURFACE 430 SQ. IN.
MOTOR 260 H.P. MERCEDES.
SPEED 105 M.P.H.
CIELING 19.500 FT.



A German two-passenger battleplane captured by the French

THE PRESENT STATE OF THE GERMAN AVIATION PROGRAMME

By E. H. SHERBONDY

THE present German Aviation Programme was laid out not only to meet the necessity of competition of the Allies on the battlefield, but also to harass the civilian population of England and France, or rather more accurately, to terrorize them into thinking that further carrying on the war was useless.

In 1916, General von Hoeppner became Dictator of the German Air Programme. He commenced by organizing propaganda in favor of aviation. Recompenses and honors for deeds of valor of pilots, citation of their names in communiques and by the exhibition of captured aviation material in Berlin. Voluntary enlistments in the aviation corps were encouraged and enthusiasm for this branch of the service was aroused amongst the élite of the people.

As to the material side of the programme, von Hoeppner addressed the various constructors of aeroplanes and motors and charged them with the construction of new types of planes, capable of competing with the Nieuport and the Spad.

Two new types of planes were inaugurated, the Halberstadt and the Roland. In these planes the factor of safety was reduced in order to make possible great rates in climbing and speed. All the shops possessing equipment for the manufacture of aeroplanes, were requisitioned and further to increase the efficiency of the programme, arrangements were made to standardize new types. The construction of aeroplanes was to be increased at a very rapid rate.

The Albatros, single-seated, fighting plane of 170 and 260 h.p., was put through in series. Later a two-seated Albatros of 260 h.p., was put through in series. The D.F.W. and the A. E. G. bombing planes, were also put through in series.

The Gotha shop at Erfurt undertook the construction of a three-seated 2-motored plane, which has since been frequently used in the raids on London

Further standardization was attempted in connection with the motors and the rotating type of engine was abandoned. Four motors were standardized, namely, The Benz of 170 and 225 h.p., the Mercedes of 170 and 260 h.p. Finally in connection with the organization of flying corps, von Hoeppner organized six of these with one hundred men per corps, flying single-seated machines and each of these men were furnished with four monitors or ground men.

Further to increase the enthusiasm, the nominal pay of a pilot was raised to $95.00. In addition to this, there was a bounty arranged for, as a sort of reward for operations against the enemy, which amounted to $15.00 a month for the common soldier, and $30.00 a month for the Adjutant and $75.00 a month for the officer in charge of the escadrille or flying corps.

Intensification of Manufacturing

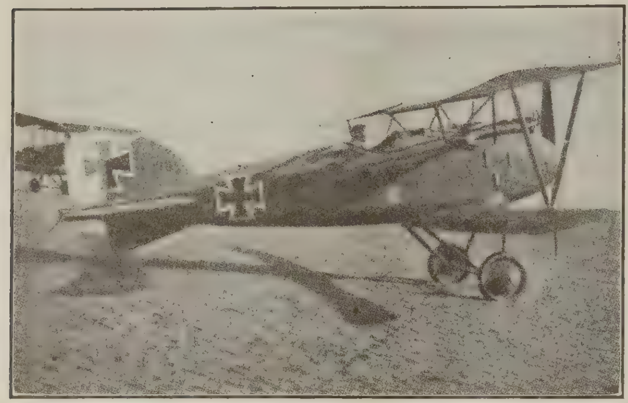
Under von Hoeppner's able management, more than fifty shops were employed in the construction of planes and flying corps was provided for the protection of aviation training camps and manufacturing plants, which were located at Berlin, Cologne, Altona, Johannisthal, Potsdam, Charlottenburg, Dresden and Spandau.

The Fokker Company purchased the piano plant of Berzma at Mecklenburg-Schwerin and other important places were fitted up in the manufacture of aeroplanes. The production of planes during 1916 was slightly more than 2,500.

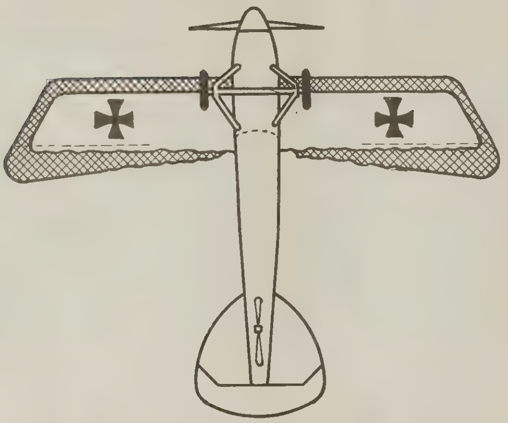
The aviation corps was divided into four branches:

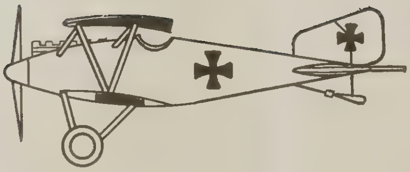
(a) The army flying corps which is composed of ten units.

(b) The naval aviation corps which



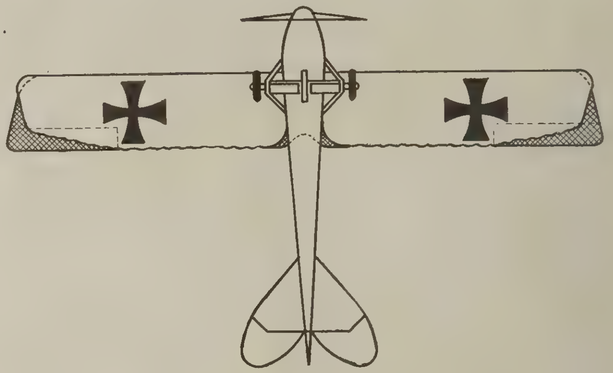
A German aeroplane captured by the British in Palestine
(British official photo)

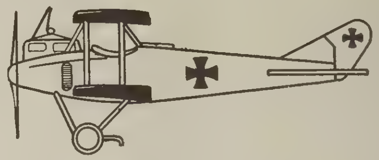




SINGLE SEATER 1917 ALBATROS.
PRESENT MODEL.

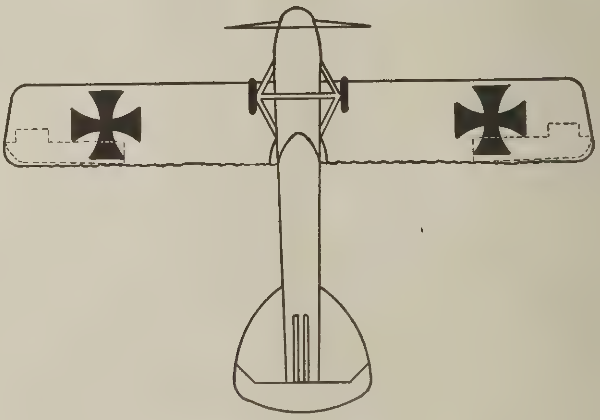
WING SURFACE 215 SQ. FT.
MOTOR 170 H.P. MERCEDES.
EQUIPMENT 2 MACHINE GUNS.

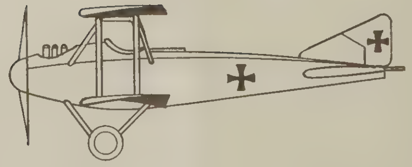




TWO PASSENGER 1917 D.F.W. ALSO KNOWN
AS D.W.F. AVIATIK AND L.V.G.

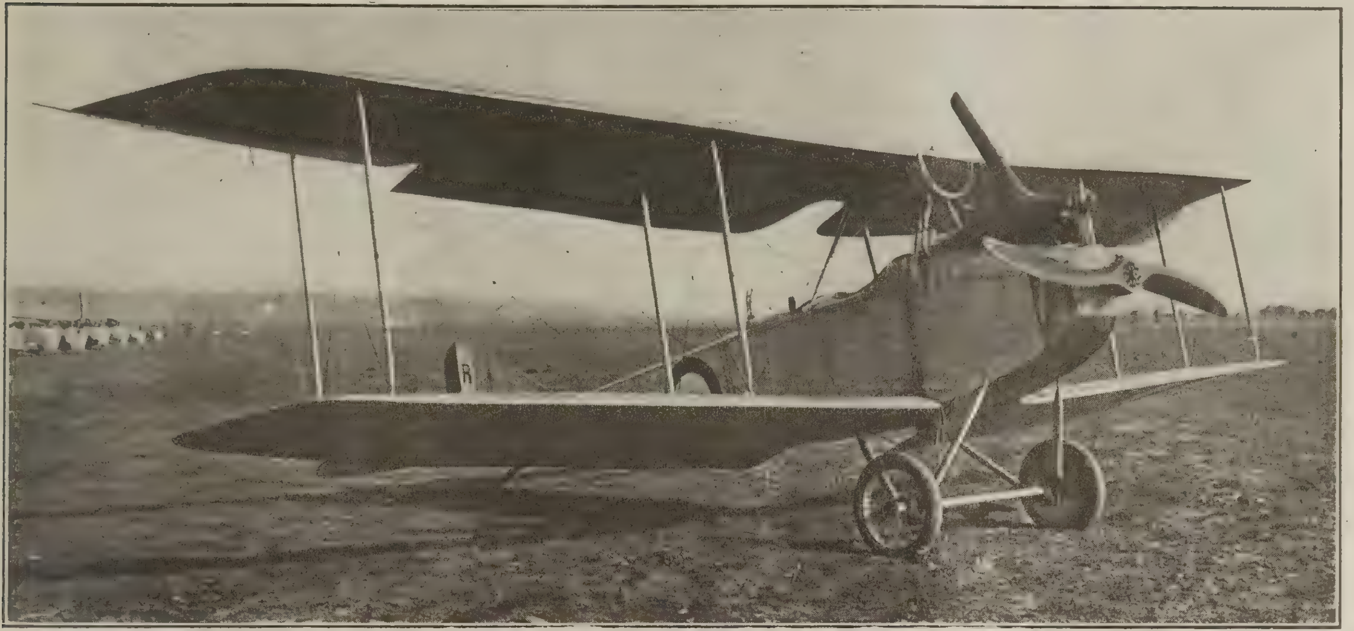
WING SURFACE 450 SQ. FT.
MOTOR 230 H.P. BENZ.
EQUIPMENT 2 MACHINE GUNS.





TWO PASSENGER 1917 ALBATROS
FOR FIGHTING, BOMBING, AND PHOTOGRAPHY.

WING SURFACE 450 SQ. FT.
MOTOR 230 H.P. BENZ.
EQUIPMENT 2 MACHINE GUNS.



A Rumpler type of German machine captured by the French. (French official photo)

is composed of three land units and seven sea units.

(c) The training camps.

(d) The flying corps for the protection of training camps and manufacturing plants.

At this time the Gotha is the most interesting of German aeroplanes and belongs to the bombing plane class. It was the first observed in service in October, 1916, after a Handley plane had been landed intact on enemy territory and no doubt the appearance of this plane was a cause of development of the Gotha in Germany.

The 1916 Gotha was equipped with 2 six-cylinder Mercedes motors of 260 h.p., they had a speed of 80 miles per hour and their rate of climb amounted to 10,000 feet in twenty minutes and 13,000 feet in thirty minutes.

They carried three machine guns, one operated at the front and two to the rear. One was placed below, so as to shoot under the tail of the plane and the other arranged so as to have a large arc of fire above the rear of the fuselage. The fuel tanks had a capacity of 80 gallons. The planes had a four hour flying radius, they were quite heavy and although they did not manoeuvre with great speed they gave considerable satisfaction in the services for which they were destined.

In August, 1917, there appeared the Gotha triplane, designated, Ursinus-11. It was constructed by Basse-Delve at Altona. It is equipped with 2 150 h.p. engines and was capable of carrying twelve passengers.

For military purposes the crew consisted of four men only. The load carried in addition to the crew was 400 lbs. of bombs and 1½ inch cannons, three machine guns and it had a fuel tank capacity of 145 gallons. It could climb 6,000 feet in twenty minutes, and it had a flying radius of 500 miles. The fuselage was constructed of laminated wood and the wings were covered with transparent material. This type was later on abandoned. The more recent Gothas are equipped with two motors of 260 h.p., (Mercedes), and carry a crew of three men with a load in addition to this of 2,725 lbs.

Herewith is a curve showing the rate of climb. The useful load consists of 1,050 lbs. of fuel and oil, 1,150 lbs. bombs, machine guns and 520 lbs. of other equipment. Still another Gotha is equipped with 2 260 h.p. (Mercedes) motors and three machine guns and has a speed of 87 miles an hour and carries fuel for five or six hours flight and 50 bombs of 33 lbs. weight each.

Another type of Gotha is equipped with three Mercedes motors of 260 h.p., one motor being arranged in front of the fuselage as a tractor the other two motors being placed on the wings, with the propellers in the rear. This plane has 118 ft. wing span.

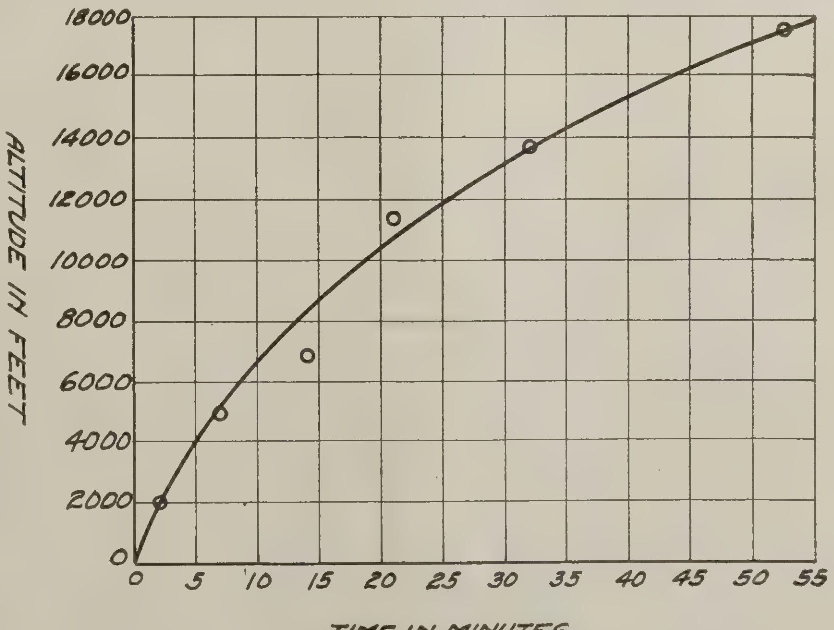
Still another type of Gotha of 138 ft. wing span, has been constructed with six 260 h.p. Mercedes motors, two of these are placed in a single Nacelle and are geared together through to a single propeller.

The Gothas have been built principally for long voyages and bombing London and Paris.

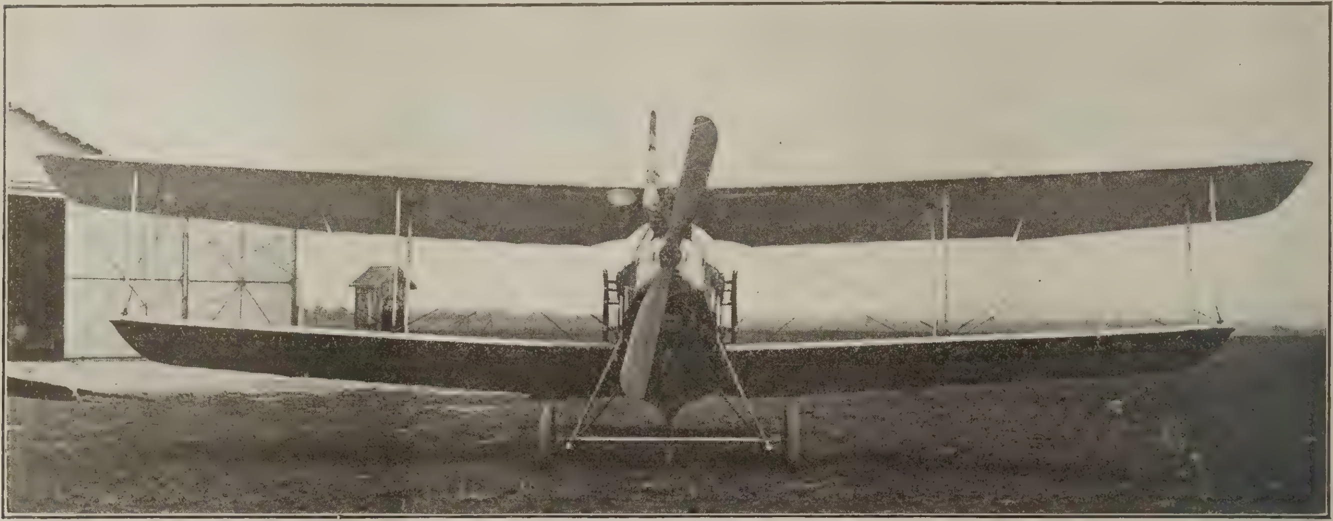
The German Flying Corps, acting with the Turkish and Austrian armies, used the A. E. G. bombing plane (German General Electric Company). For combat plane, the most modern is the Fokker Triplane which was copied from the English Sopwith Triplane and this is the type of plane most recently used by the late Baron von Richthofen.

The first one of these captured by the French, was piloted by Lieut. Voss Crefeld, who after forty-nine victories on the British front was shot down. This triplane is constructed without wires of any kind and is equipped with two machine guns, firing through the propeller. It can climb to 14,750 ft. in seventeen minutes and is equipped with a Siemens-Schuckert rotary motor of 160 h.p., and it is remarkable for its speed and manoeuvre ability.

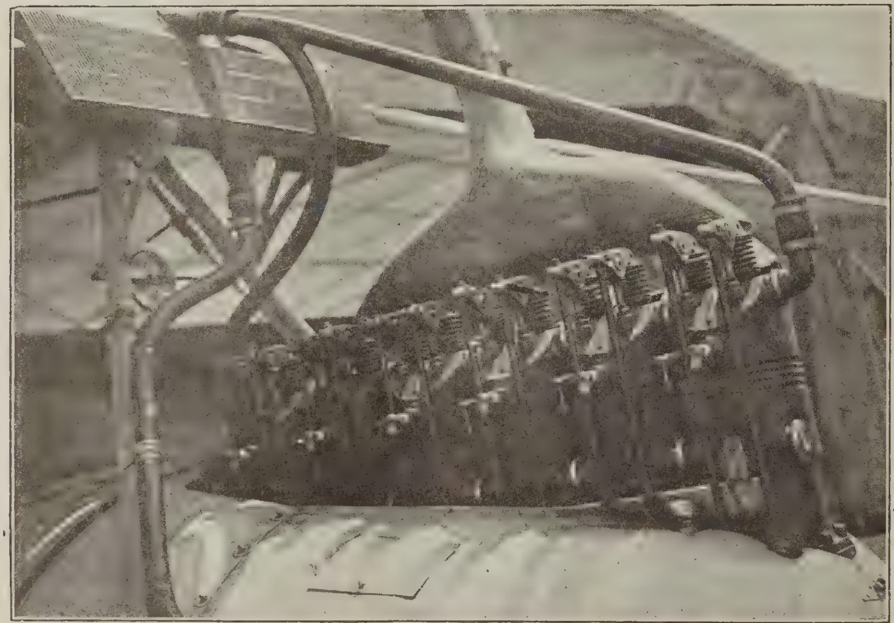
The best German combat plane is the Rumpler, it is equipped with a single, 260



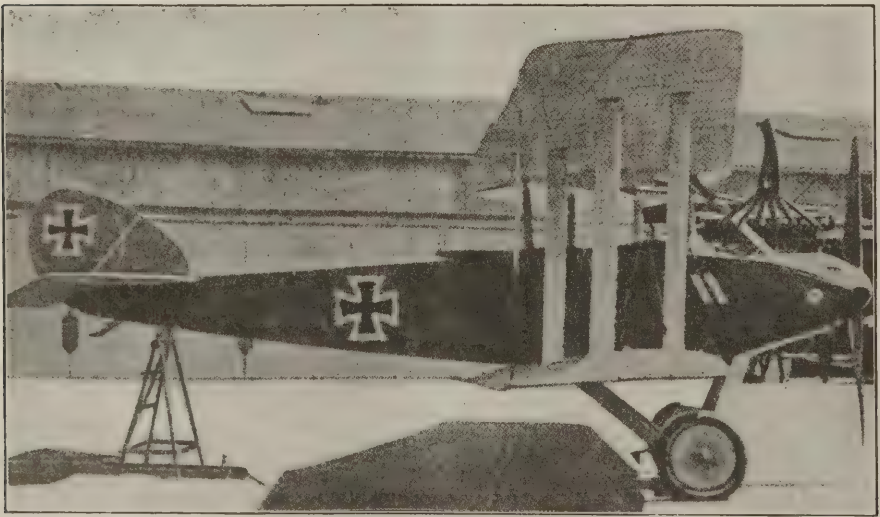
RATE OF CLIMB OF TWO MOTORED "GOTHA" (260 H.P. MERCEDES)



A Rumpler type of German machine captured by the French. Note the location of the radiators. (French Official Photo)



The engine mounting of the Benz in a late type of German aeroplane



Side view of the German A. G. O. Biplane, with its characteristic interplane strut construction

h.p. motor, and has a speed of 123 miles per hour.

One of the most interesting planes that has been constructed by the Germans is the Junkers-Benz, which is entirely constructed with metal and is equipped with 225 h.p. Benz motor. It has a speed of only 80 to 87 miles per hour and a very slow rate of climb. Its ceiling being 10,000 ft. which altitude can be attained in about an hour.

The test to which new planes of new types are put, especially those for military purposes are unusually severe. General von Hoeppner indicates the general type desired and the various constructors have everything put at their disposal to carry out the programme as outlined. When the experimental new planes desired have been built, a military commission examines them and tests them for stability and endurance. If they do not prove satisfactory, they are rejected without further consideration and the shop which has constructed them is severely penalized. The shops are also severely penalized if any unusual difficulties appear in the types which have been adopted and are being manufactured in series.

The general acceptance test for motors, is a run of 66 consecutive hours duration and if any difficulty appears in the tests of current types, the manufacture of the motors is at once stopped and the entire series is re-designed with the necessary improvements to permit of getting through this 66-hour run.

Armament

All the planes are equipped with machine guns. The 3-seated machines carry in addition Mauser guns in some cases and in others, Spandau guns. They carry from 600 to 1,000 cartridges. For each machine gun there are four kinds of cartridges carried:

1st: Bullets wih a very hard steel nose cap.

2nd: A smoke bullet which explodes at 650 to 1,000 ft. from the gun, giving off a cloud of white smoke.

3rd: Tracer bullets which permit the pilot to rectify his aim by seeing these bullets from 650 to 1,000 ft. from the gun.

4th: Incendiary bullets which may be employed for setting fire to buildings and more particularly observation balloons.

Three forms of bombs are used:

1st: Piriformes of 25 lbs., 120 lbs. and 200 lbs. with delayed ignition. The explosives charges in each of these bombs are 3 lbs., 65 lbs. and 100 lbs.

The second class of bombs are:

Spherical bombs of 130 lbs. with explosive charge of 80 lbs.

The third class of bombs are: Incendiary bombs.

In the following table are given the names of the principle German aeroplane constructors and the types indicated:

Gotha
Biplane with two motors.
Biplane, 3-seated.
Biplane, 3 motors—Biplane, 6 motors.

Fokker
Reconnaissance plane with A.E.G., 3-seated.

Albatros
Combat Plane.

L. F. G.
Fighting plane, 2-seated.

Rumpler
Large bombing reconnaissance plane.

A. F. G.
Large bombing plane with 2-motors.

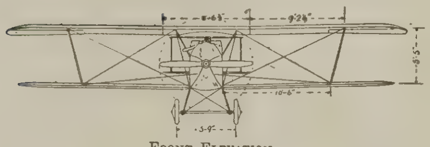
L. V. G.
Rumpler reconnaissance plane.

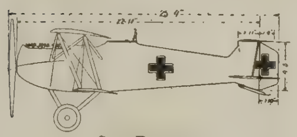
Halberstadt
Combat biplanes.

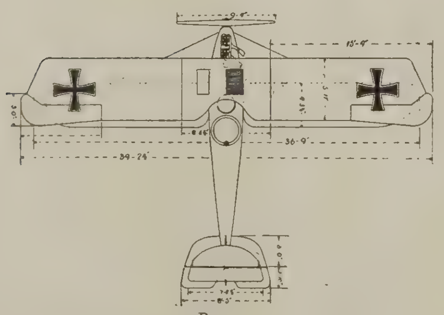
D. F. W.
Reconnaissance plane.

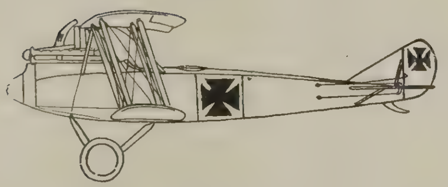
Brandenburger
Hydro Aeroplane for Austria.

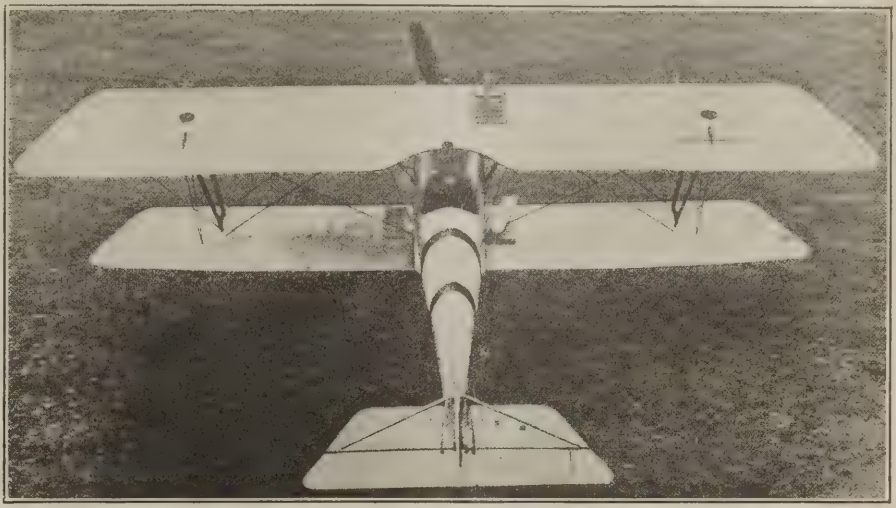
M. F. W.
Combat planes.


FRONT ELEVATION


SIDE ELEVATION


PLAN


Profile of the Rumpler C-4 type (German)


View from above of the German Pfalz single-seater fighter, showing rudder construction

RECORDS AND PERFORMANCES OF THE AERO MAIL SERVICE FOR THE MONTH OF JUNE

The following list of performances in connection with the Aero Mail Service has been compiled and issued by Asst. Postmaster Praeger. The list shows conclusively the increase in efficiency and the rapid improvement in service in two short months since its inception.

PERFORMANCE OF AVIATORS DURING MONTH OF JUNE, 1918.

Total possible number of flights	100
Total possible mileage	11,250
Total perfect (uninterrupted) flights made	88
Total interrupted flights made	8
Total flights defaulted on account of weather	4

	Perfect Flights No.	Perfect Flights Miles	Interrupted Flights No.	Interrupted Flights Miles	Uncompleted Flights No.	Uncompleted Flights Miles	Total Flights No.	Total Flights Miles
Lt. J. C. Edgerton	18	2,430	1	135	0	0	19	2,565
Lt. Stephen Bonsal	14	1,890	1	135	1	40	16	2,065
Lt. E. W. Killgore	13	1,710	2	270	1	25	16	1,440
Lt. Walter Miller	18	1,620	1	135	1	45	20	1,800
Lt. T. H. Webb	16	1,440	0	0	0	0	16	1,440
Lt. H. P. Culver	9	810	0	0	0	0	9	810
Total	88	9,900	5	675	3	110	96	10,685

AERIAL MAIL OPERATION FOR THE MONTH OF JUNE.

Date, 1918 June	Miles flown 1	Hours of flying hrs. 2	Hours of flying min.	Mail carried A. 3	Mail carried O.	Per cent of performance 4	Arrival Wash. 5	Arrival N. Y.
1	360	5	11	37⅝	221	75%	4.55	3.25
3	405	5	41	36	253½	75%	4.25	2.43
4	450	6	35	37½	463	100%	3.20	2.58
5	450	5	58	44½	469½	100%	3.15	2.28
6	450	6	06	54	610½	100%	4.15	3.40
7	270	4	11	20	272	50%	3.55	4.45
8	340	4	55	38	266½	75%	9.15	3.05
10	450	6	31	51½	463½	100%	4.07	2.35
11	360	6	57	40	219	75%	3.45	3.47
12	450	7	46	49	612	100%	6.05	3.12
13	450	6	43	45	719	100%	3.22	2.54
14	450	6	46	45	524¼	100%	4.30	2.23
15	450	6	23	37	616	100%	3.10	3.10
17	450	5	56	41	431	100%	3.42	2.36
18	450	6	20	37½	504	100%	3.15	3.05
19	450	5	46	41	497	100%	3.05	2.51
20	450	5	46	39	600	100%	3.15	2.33
21	450	6	48	46	582	100%	4.12	2.40
22	450	6	01	34	513	100%	4.00	2.46
24	450	6	11	40	564	100%	4.00	3.25
25	450	5	47	40	577	100%	3.20	2.47
26	355	4	27	28	379	75%	3.05	4.20
27	450	5	51	38½	478	100%	2.50	3.10
28	450	6	07	39½	685	100%	3.17	2.43
29	450	6	39	30½	571	100%	5.15	3.25

Note: Number hours dead flying for month, 8 hours 38 minutes.

Explanation of Tabulation:

1. *Miles flown:*

Leg from Washington to Philadelphia	135 miles
Leg from Philadelphia to New York	90 miles

Miles flown for the day, whether one, two, three, or four legs of the trip have been made. The aim is to get exactly the number of miles flown in connection with the mail service each day. Therefore, mileage of partial trips should be indicated.

2. *Hours of flying:* To include the actual hours and minutes machine is in the air with mail.

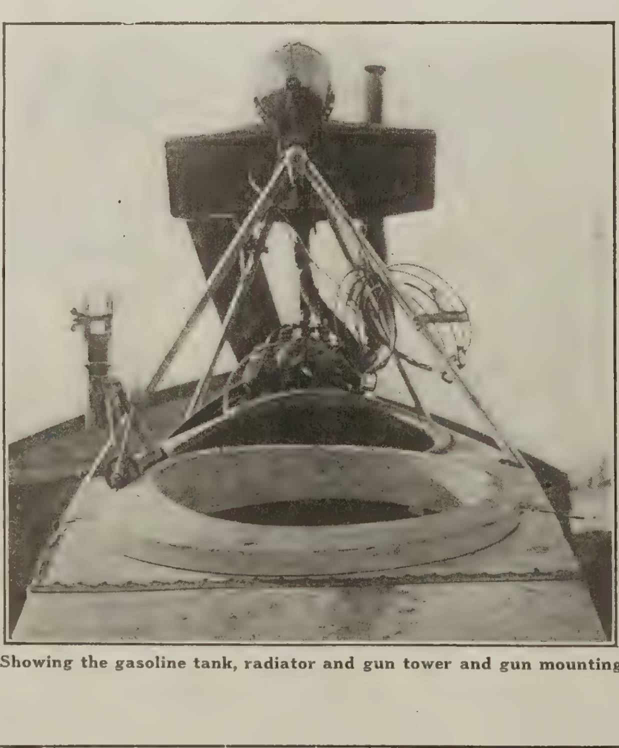
3. *Mail carried:* In the column under A., give pounds of aeroplane mail; and under O., give pounds of ordinary mail.

4. *Per cent of performance:* Round trip Washington-New York consists of four legs, each leg valued at 25% if completed by aeroplane and not by train before close of day.

5. *Arrivals:* Time plane reaches Washington and New York, or, if train carrier, the scheduled time.

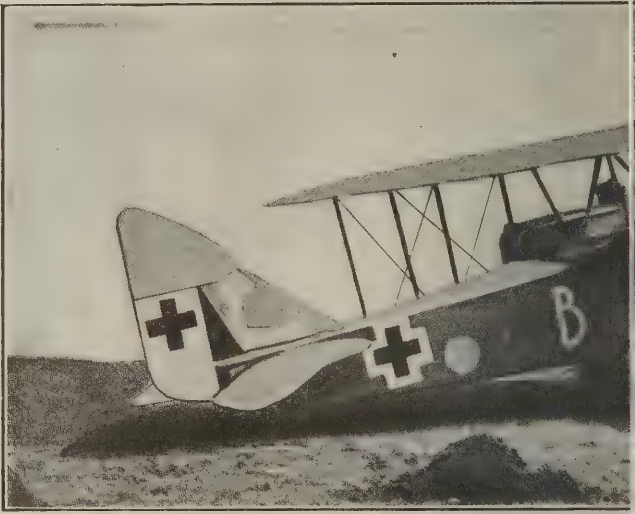
SOME GERMAN AEROPLANES—

A single motored German biplane



Showing the gasoline tank, radiator and gun tower and gun mounting

A pusher type twin motored German b

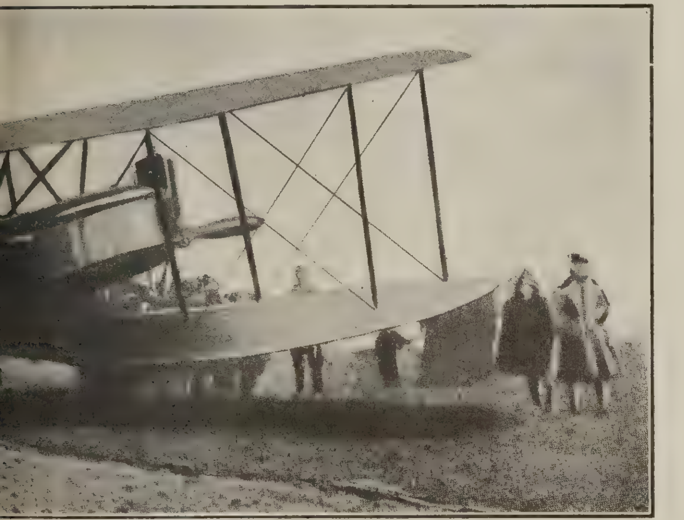


A German Gotha captured by the F

An interesting German machine captured by the French and s

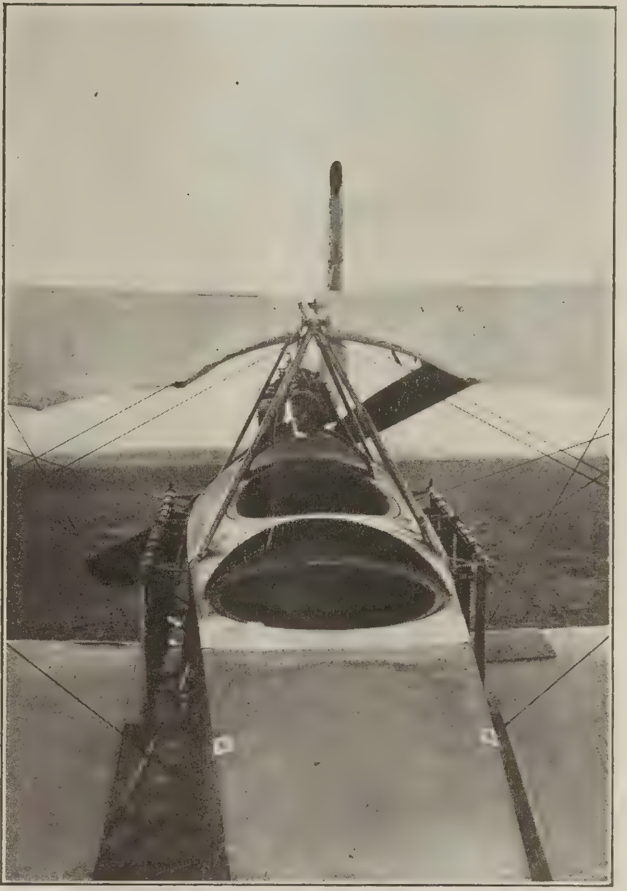
INGLE AND DOUBLE MOTORED

ng machine brought down by the French

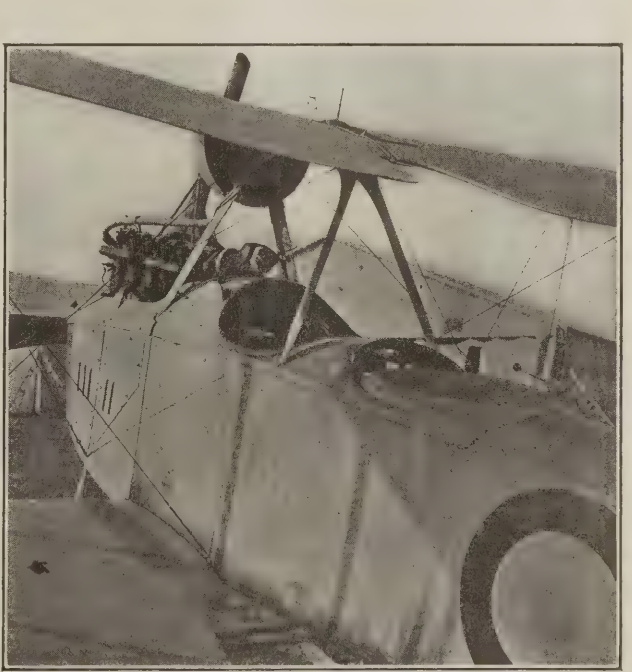


h Air Service in the environs of Paris

quently used for training by the French. (French official photo)



A two passenger German biplane with radiator on the side



A two seater German biplane used for training by the French

NAVAL *and* MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point. Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points mentioned in order named for temporary duty.

Note 2—Report to Superintendent of operations, aviation field, Dayton, Ohio.

Note 3—Report to District Manager of Production, Bureau of Aircraft Production, Detroit, Mich.

Note 4—Report to Chief Engineer, Bureau of Aircraft Production, Mutual Bldg., Dayton, Ohio.

Note 5—Report to Eastern Dept., Governors Island, New York.

Note 6—Report to Waltham, Mass., and wire District Approvals Officer, Bureau of Aircraft Production, 480 Lexington Ave., New York City.

Note 7—Report to Union Switch and Signal Co., Swissville, Pa.

Special Orders Nos. 153 to 157, Inclusive

A

Aldridge, William S.	FRF
Ammel, Roy W.	PFO
Avera, John W.	LHV
Aubuchon, Joseph M.	GLC
Abbott, Edwin I.	EOT
Addington, Edward P.	FRF
Ainslie, Walter M.	DIK
Armstrong, Max V.	FRF
Adams, John W.	RSD
Allan, Roy F.	FRF
Aloe, Myron	TFT
Andrews, Frank H.	WFO
Ames, Theodore G.	WFO
Austin, Calvin E.	WFO

B

Boulware, George L.	FRF
Bates, Graham M.	FRF
Brown, Frederick L.	SLR
Boyce, Cyril	SLR; GLC
Bollman, Merle H.	CGC
Boggs, Stanhope S.	SLR; AAD
Baldwin, Maurice B.	VBW
Blewett, Gideon A.	FRF
Brand, Gaston L.	TMA
Burch, James Cook	SLR; WFO
Boggs, William Graves	SLR; SBI
Blum, Albert Harold	SLR; SBI
Booth, Harold W.	CWT
Bates, John H.	PFO
Bruch, Russel L.	PFO
Babcock, Henry S.	BST
Blotter, Richard Gottlob	SLR; WFO
Bennett, Jerry L.	FRF
Baker, Robert H.	PFO
Brown, Henry J.	BST
Buckland, William E.	BST
Barr, Lester S.	LDT
Blanchard, Carleson W.	LDT
Brants, Harry E.	LHV
Barnes, Dwight F.	PFO
Burnet, Gilbert W.	PFO
Beman, Ransom H.	FLR
Bailey, James R.	GLC
Barnhart, Leroy W.	FRF
Burditt, Rollin A.	FRF
Barnhill, William A.	CGC
Burns, John V.	FRF
Barbee, Wyatt	CGC
Braun, Milton F.	FRF
Breese, Winfield Starr	SLR; KST
Bakala, Chester Chandler	SLR; KST
Bertraud, Lloyd W.	FRF
Bazley, Halsey Rapson	SLR; TFT
Bramlette, James L.	CWT
Bailey, Louis C.	LDT
Blackmer, Lawrence M.	LDT
Brown, Wallace Allen	FRF; SLR; CRI
Brown, David K.	FRF
Barrett, William J.	FRF
Buell, Llewellyn M.	DMA
Broderick, William J.	LDT
Bidwell, Robinson E.	LDT
Batchelder, William W.	FRF
Bralley, Ernest M.	FRF
Bacon, Christian O.	DIK
Beiseker, Charles Edwards	SLR; RSD
Benham, Reid F.	FRF
Brooke, John Morgan	SLR; WFO
Bradford, Thomas L.	TFT
Brumback, Jefferson U.	RSD
Bucklin, William N., Jr.	DMA
Bosworth, William O.	LHV
Baxter, Robert K.	WFO
Blackburn, James M.	WFO
Blake, John R.	WFO
Blan, Ollie L.	WFO
Bogel, Galitzin M.	WFO
Bolz, Adolph C.	WFO
Bonesteel, J. William Kenneth	WFO
Burmeister, John C., Jr.	WFO
Bacon, Max E.	WFO
Bardens, William M.	WFO
Batten, Eugene C.	WFO
Bfughan, Stephen D.	WFO
Bender, Ned J.	WFO
Benton, John W.	WFO
Blain, John D.	WFO
Blair, Byron S.	WFO
Brown, Edward S.	WFO
Bailey, John W., Jr.	TFT
Baer, Milton D.	TFT
Bebbm, Edwin ^	
Bowen, Claude M.	TFT

Blakely, George W	TFT
Brown, Isaac G	TFT
Baez, Raphael, Jr	TFT
Burke, Hubert J	TFT
Braun, Arnold W	TFT
Buckmaster, Samuel A	TFT
Brown, William D	WFO
Boggs, Marshall S	CJS
Bondurant, David S	CJS
Buckner, Frank	CJS
Broadick, John N	WFO
Bowers, Charles Robert	SLR; CAF
Bruns, Christopher Leslie, Jr	SLR; DAF
Borden, Frank K	WFO
Butler, Henry W	Note 3

C

Commins, Charles M	VBW
Cole, Myron A	CGC
Conner, William F	CGC
Couberly, Lawrence B	FRF
Chase, Oscar F	VBW
Cooper, Sidney B	VBW
Caminetti, A., Jr	VBW
Cahill, Harry J	VBW
Cooper, Robert B	FRF
Clune, Edmund A	DMA
Crane, Emerson P	VBW
Carmine, John W. S	FRF
Cavagnaro, James F	FRF
Cushman, David D	CGC
Case, Ira H	TMA
Canute, Olin J	TMA
Clark, Smith D	LDT
Collins, Raymond B	LDT
Crebbs, Earl Raymond	SLR; BST
Cameron, David	LDT
Cole, Dausa W	LDT
Codner, Ray Kile	SLR; WFO
Copley, DeWitt Hayden	FRF; SLR; AAD
Carroll, Mitchell Benedict	SLR; WFO
Colliver, Harry F	BST
Cox, Gilbert Harold	SLR; DAF
Charlton, John Porter	SLR; SBI
Chase, Cecil Arthur	RSD
Cook, Charles C	CGC
Campbell, Hayden S	FRF
Coffee, Harold L	DIK
Conkling, Ronald	SLR; KSD
Compton, Earl Victor	SLR; RSD
Colleton, Thomas E	FRF
Cole, Robert A	CWS
Castle, Benjamin F	DMA
Currie, Kent D	FRF
Childress, Charles W., Jr	FRF
Crawford, Frank H	PFO
Caldwell, Jabin B	LDT
Clauss, Albert F	LDT
Cummings, Frank J	LDT
Cole, Harold L	BST
Clark, Halford	FRF
Cumbus, John William	SLR; PMT
Cooper, Forrest G	BST
Colton, Deane Whittier	SLR; WFO
Campbell, Walter M	PFO
Clark, McKinley F	FRF
Cauthen, James C	LHV
Collins, Thomas Leon	SLR; WFO
Cline, Harold V	GLC
Cannon, Lawrence H	TFT
Crane, Oliver P. H	TFT
Cushing, Daniel	CPR; DAP
Cantey, Samuel M	WFO
Carter, Aubrey L	WFO
Carter, John Owen	WFO
Corsant, Jesse H	WFO
Cantwell, James W	WFO
Carrier, Alfred C	TFT
Cruickshank, Colin J	TFT
Callans, Paul J	WFO
Calkins, Reginald J	WFO
Claude, Lawrence	WFO
Christie, Donald C	WFO
Codington, Arthur D	WFO
Coombs, Cyril L	WFO
Crawford, Reed F	WFO
Cummings, David R	WFO
Carter, Henry	WFO
Coit, Charles	Note 6

D

Doerr, William, Jr	FRF
Dade, Alexander L., Jr	CGC
Dow, John R	DIK
Dallas, Burnie R	LDT
Dietrich, Richard H	LDT
Duddleston, Charles S	DMA
Dorner, Earl V	FRF
Dawson, Thomas E	FRF
Decker, Richard Fisher	SLR; DMA
Davis, Kenneth M	GLC
Doolittle, James H	GLC
Detlefsen, Gustav Christian	SLR; RSD
Daley, Vincent Lawrence	SLR; BFT
Dudley, John E., Jr	TFT
Dorr, Philip J	DIK
Davis, George E	DIK
DeLashmutt, Harry A	FRF
Dixon, Rollin L	FRF
Dahlstrom, Frank Richard	SLR; BST
Davis, Owen D	VBW
DeVore, Kenneth L	PFO
Daley, Walter F	LDT
Davis, Edwin K	LDT
Davis, Franklin Breckenridge	SLR; SBI
Dussere, Louis	SLR; SBI
Daniels, William C	LDT
Dana, Deane	LHV
Dewey, Robert A	PFO
Davis, Robert Wallace	SLR; DAP
DeHoog, Raymond E	WFO
Diavila, Louis B	WFO

E

Eldridge, John R	FRF
Ebbott, Percy J	CGC
Ebi, Kenneth A	FRF
Eaker, Ira C	FRF
Evans,, Richard Warren	SLR; SBI
Enright, Walter J	DMA
Elliott, Ira J	LDT
Ellis, Edgar Harold	SLR; PMT
Engblom, Oscar Henry	SLR; KST
Eichelberger, Raymond T	LDT
Evans, Edwin Bernard	SLR; SBI
Edrington, John P,. Jr	DIK
Ebert, Solomon B	GLC
Etnyre, Mentor	FRF
Elkema, Emil Carl	SLR; RSD
Ehrenberg, Conrad E	DIK
Everett, Aylett L	WFO
Elliott, John J	CJS
Eckstrom, Lawrence J	WFO
Elsey, George W	WFO

F

Foreman, James A	VBW
Felt, Lee W	FRF
Friedman, Max H	FRF
Frakes, John	CGC
Fairclough, Richard N	GLC
Frederick, Karl A	EOT
Fox, Arthur W	PFO
Fritts, Ralph V	LHV
Frink, George W	FRF
Faulkner, Richard Manning	SLR; SBI
Ford, Charles Edward	SLR; SBI
Field, Howard, Jr	SLR; PMT
Fenwick, Herbert Frederick	SLR; PMT
Foster, Lindsay B	FRF
Fischer, Karl Willard	FRF; SLR; CRI
Feldman, Hans Adolph	SLR; CRI
Friesen, Ernest C	RSD
Ferris, William R	CJS
Freydig, Paul E	CJS
Fries, Waldemar	CJS
Farris, Homer V	WFO
Foster, Lee W	WFO
Friday, Ellsworth C	WFO
Fulwood, Charles W., Jr	WFO
Ferguson, George F	WFO
French, Samuel L	WFO
Fulwiler, Howard D	WFO
Fields, Curtis P	FRF
Fratt, Charles D	TFT
Farmer, William H	WFO

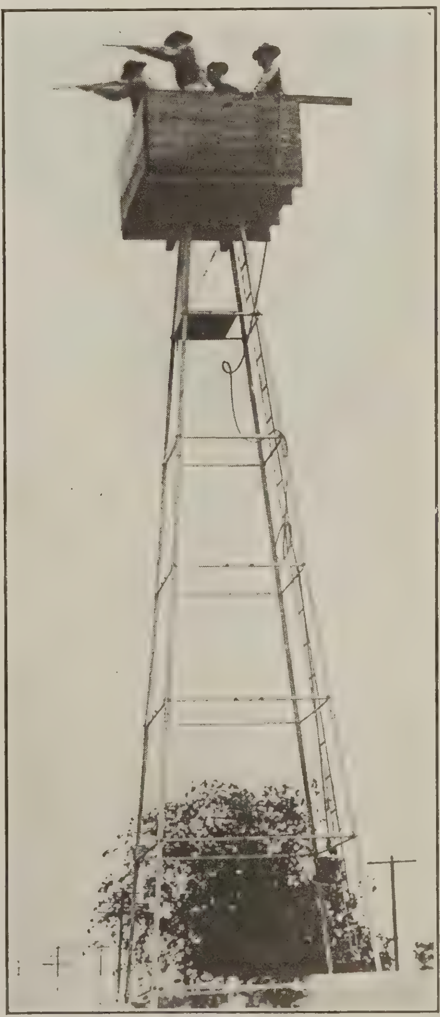
G

Gaskell, Ellsworth F	FRF
Gale, Henry G	MJR
Granville, Bernard R	CGC
Gray, David	CPR
Gruny, George Robert	SLR; KST
Germer, Lester H	FRF
Gilman, Harold A	LDT
Grimm, Frederick	SLR; LHV
Goos, Carl N	GLC
Grubb, Kenneth P	LDT
Guthier, Roy E	PFO
Goddard, Fred C	PFO
Gerlinger, Charles	FRF
Gleerup, William W	LDT
Goodnight, Harry Lynn	FRF; SLR; WFO
Goldsmith, Henry Stanhope	SLR; WFO
Gibson, Julius Robert	SLR; RSD
Garesche, Edmond A	FRF
Gallaher, Charles Daniel	WFO
Green, Lonsdale, Jr	FRF
Gifford, Franklin R. S	DIK
Gothlin, Oliver P	CJS
Godman, Louis K	CJS
Garrett, Joseph R	WFO
Gunn, Roy Eugene	WFO
Gardner, Roy B	PMT
George, Marshal W	,
Giddings, Joseph A	WFO
Gormley, Richard R	WFO

H

Hoyt, Ross G	FRF
Hutson, Harry M	DIK
Holborn, Clarence E	FRF
Haines, Frank B	FRF
Hoffman, Verne W	FRF
Hawn, Albert R	VBW
Hall, Murray M	FRF
Hollander, Cyril M	CGC
Harter, Ray C	FLR
Howson, Hubert A	FLR
Hayes, Leslie E	BST
Howard, Lynn F	BST
Hart, John F	LHV
Hesser, John W	FRF
Hersloff, Sigard N	EOT
Hawthorn, Fred William	PMT
Hartnett, Harold Joseph	SLR; SBI
Hunt, Gilman C	EOT
Hodges, Alvin R	GLC
Harding, Frank E	RSD
Healey, Claude S	LDT
Hughes, Joseph K	LDT
Hirschfield, Ira W	CWT
Holway, Lowell H	BST
Halpin, John H	FRF
Holmes, Robert B	PFO
Hitchcock, William C	BST
Holmes, George G	LDT
Hoban, Edwin A	VBW
Hager, Daniel I	LDT
Hubbell, Edward S	LDT
Hillhouse, John Grover	SLR; CWT
Hanks, Stedman S	KST
Hungerford, Clarence I	FRF
Hiatt, John Brookover	SLR; RSD
Hastings, Edward R., Jr	DIK
Hutson, Harry M	FRF
Haldeman, Ward Franklin	SLR; WFO
Holt, Arthur Parker	SLR; CFT
Hill, Hamilton Lane	SLR; WFO
Holmberg, Gustave A	DIK
Hartman, Frederick S	PFO
Houston, Byron	SLR; EOT
Huffman, William Edward	SLR; FOB
Hulbert, Ray C	VBW
Haworth, George W	DIK
Hoag, Charles Edward, Jr	SLR; WFO
Howard, Edward P	CJS
Hutchinson, James T	CJS
Hartline, William R	TFT
Horter, Edward M	WFO
Harding, Noah	WFO
Haddock, James P	WFO
Hansen, James H	WFO
Harrigan, Cornelius Herbert	WFO
Harrison, Elbert I	WFO
Heath, Edward P	WFO
Helgesson, Henry T	WFO
Henderson, Jacob E	WFO
Hodge, Gleen B	WFO
Hoffman, Malvin G	FRF; WFO
Hoggatt, Floyd L	WFO
Honn, Lawrence C	WFO
Hopkins, Ward D	WFO
Howard, Harold H	WFO
Hoyt, Werner F	WFO
Hunn, William F	WFO
Henderson, John S	CJS
Hayner, Norman A	TFT
Henry, William L	TFT
Hackedorn, Hillis F., J	WFO

(*Continued on page 975*)



Aviation cadets learn aerial gunnery by shooting at clay pigeons from a height

FOREIGN NEWS

FRANCE

A dispatch from a correspondent at the French Headquarters in France says of aerial operations on the 16th of July:

Five bridges, established yesterday west of Dormans, were destroyed by aviators and by artillery, despite the mist and smoke clouds with which the enemy sought to hide his passage of the Marne.

The French airmen have from the beginning carried out with striking success their vital work of scouting. At the same time fighting and bombing planes have taken an important part in the battle.

Fourteen tons of explosives were dropped on the German lines of communication north of the Marne.

Forty-one enemy planes were brought down, and three balloons were destroyed, three of them within five minutes by one aviator.

Lieutenant Bourgade's squadron of chasers, by their machine gun fire, completely stopped a large body of German troops from getting over one of the bridges for a quarter of an hour.

A dispatch from Paris dated July 17, says: Ninety-four Germans were killed and seventy-four other Germans were wounded on the night of July 15-16 when five German aviators bombed a prisoners' camp in the region of Troyes, thirty miles behind the French battlefront. The aerial bombardment lasted for one hour. Two French soldiers of the camp guard were wounded.

The work of the French air forces in the operations is described in an official communication issued on July 18th as follows:

"Our aerial forces have continued to play a brilliant part in the battle. On July 16 and 17 our bombing escadrilles attacked without cessation the bridges over the Marne, obstructing the passage of enemy troops. These troops, attacked by machine guns and bombs at the moment of debouching on the north and south banks of the river, suffered serious losses, and were obliged to disperse several times.

"A bridge thrown across the river by the enemy in front of Dormans was copiously sprinkled with projectiles and collapsed. A convoy which was crossing it was engulfed in the river.

"Our bombing machines likewise carried out expeditions against cantonments, railway stations, munition depots and concentration places in the enemy rear areas.

"Twenty-one tons of explosives were dropped during the day and fourteen during the night, doing much damage. A violent explosion occurred in the station at Maison Bleu. Fires broke out in the stations at Coucy, Les Etapes and Bazoches.

"Our aeroplanes, with their usual dash, have engaged in numerous combats over the enemy lines. Twenty-nine German machines were brought down or put out of action and five captive balloons were set afire on the 16th July. On the 17th July, despite the violent wind and torrential rains, our squadrons took the air and obtained good results. Twelve German aeroplanes were brought down and four captive balloons were destroyed."

The night report on July 19 from French Headquarters says:

"Our airmen, in collaboration with British squadrons, continued their work yesterday along the whole battle front. Twenty German machines were brought down or put out of commission by our pilots, and two captive balloons were burned. The British airmen destroyed seven German machines.

"Our bombing groups continued their expeditions against the crossings of the Marne. A footbridge west of Reuil was bombed and demolished. Cantonments and troop concentrations at Oulchy le Chateau, in the Vauxbuin ravine, at Fere-en-Tardenois and in the region of Oeuilly were attacked with machine guns or bombs, the troops being dispersed.

"Stations in the rear areas were sprinkled with projectiles. Fires broke out in the stations at Amifontaine and Fismes. Heavy explosions were observed at Pontavert. Twenty-two tons of bombs were also utilized in the day and twenty-one the following night.

"British squadrons dropped two tons and a half of explosives with excellent results."

GREAT BRITAIN

Sixteen German aeroplanes were brought down by British airmen on July 13th, while the British lost three machines, the air ministry announced on July 15th. More than twenty-three tons of bombs were dropped on enemy targets during the day and night.

"Twelve enemy aeroplanes were destroyed by us on July 13 and four were driven down out of control," the report stated. "Three of our machines are missing.

"A good deal of reconnoissance and observation work was carried out by our airmen in intervals of fine weather, and four and a half tons of bombs were dropped by them during the day.

"On the night of July 13-14 our bombing machines were very active. Over 1,100 bombs, weighing in the aggregate nineteen tons, were dropped upon enemy camps, railway lines, trains, transport and billets. All our night flying machines returned safely."

The official statement on aerial operations issued on July 15th says:

"The morning of July 14 our aeroplanes completed several reconnaissances and carried out much observation for our artillery.

"The afternoon was wet and stormy. The sidings at Roulers, ammunition dumps at Warneton and Bapaume, docks at Bruges and dredging parties at Zeebrugge were heavily bombed.

"Nine hostile machines were brought down and three balloons were shot down in flames. Five of our machines are missing."

British aviators again have attacked Offenburg, near Karlsruhe, and Thionville, near Metz, says the official statement from the Air Ministry, issued on July 16th. Good bursts were observed at Offenburg and a fire, followed by explosions, was started at Thionville. The statement reads:

"On July 15 the railway sidings and sheds at Offenburg and a hostile aerodrome were successfully bombed. Good bursts were observed. On July 16 our machines attacked the railway and sidings at Thionville. Several bursts were observed on the railway, a fire was started, and several heavy explosions ensued. All our machines returned safely."

The work of the British air forces in aerial operations is described on July 17th in the official statement as follows:

"On July 16 repeated thunder and rain storms prevented continuous aerial work. Our aeroplanes took advantage of the fine intervals to carry out reconnoissance work with the artillery and bombing.

"Thirteen tons of bombs were dropped on hostile aerodromes, ammunition dumps, the mole at Zeebrugge, and villages used by the enemy as billets, among them Estaires and Terville.

"Ten enemy machines were brought down in air fighting and four others were driven down out of control. In addition, six hostile balloons were shot down in flames. Nine of our machines are missing."

The following official communication was issued by the Admiralty on July 18 dealing with the navy's aerial activities:

"During the period from the 11th to the 17th of July, inclusive, Royal Air force units, working with the navy in home waters, have maintained the anti-submarine and escort patrols. Bombing raids have been carried out when the weather was favorable with good results.

"Enemy destroyers have been sighted off the Flanders coast on several occasions and attacked with bombs. A direct hit was obtained on one large destroyer.

"Our formations also have attacked destroyers with machine-gun fire. On one of these occasions five enemy seaplanes approached at the beginning of the action, but immediately withdrew.

"Enemy aircraft have been active and have attacked our bombing and patrol formations. Three hostile machines have been destroyed or driven down out of control. Two of our machines are missing. One of our anti-submarine patrol machines observed an enemy seaplane upside down in the sea. There were no occupants in it.

"Enemy attempts to salve the torpedoboat destroyer recently sunk close to Zeebrugge by a bomb from one of our machines have been greatly hindered by our bombing formations.

"During the night of July 16-17 our machines bombed the works at Hagendigen and the Burbach (Prussian) works. Good results were observed and appreciable damage was done. A hostile aerodrome was also bombed with good results. On the 17th our machines successfully attacked the railway and sidings at Thionville. All our machines returned safely."

The official statement of the Army on aerial operations issued on July 18th says:

"On July 17 the weather was cloudy at first, but improved later, allowing a considerable amount of aerial reconnaissance, photography and artillery work to be accomplished by us.

"Eleven and a half tons of bombs were dropped during the day on enemy dumps and railways and on the Brungeoise Works.

"Comparatively few enemy machines were encountered. We shot down three and drove one down out of control. We lost one machine. We also shot down six hostile balloons in flames.

"Severe thunderstorms prevented our machines from carrying out night bombing."

The British official statement dealing with aerial operations, issued July 19, says:

"On the 18th, in spite of very changeable weather, a good deal of work was accomplished by our aeroplanes, both in reconnaissance, photography and bombing.

"Much of the bombing was done from a low height, the targets including ammunition dumps around Armentieres and Merlcourt, the railway stations at Rosieres and Bray and the docks at Bruges and Ostend.

"Eight hostile machines were brought down in fights and one other was shot down by our anti-aircraft fire. ,Seven of our machines are missing."

"During the night our bombing machines dropped eight tons of bombs on the Mons-Valenciennes Railway and an additional six tons on the railways at Courtrai, Seclin and Lille. Two of the machines failed to return."

GERMANY

The night report of aerial operations issued by the German War Office on July 16th says:

"In spite of low clouds and a high wind, our aerial fighting force was active. From a low altitude our aviators with bombs and machine guns attacked in the battle on the ground. Yesterday they brought down over the battlefield thirty-one aeroplanes and four captive balloons."

Speaking of aerial operations which took place on July 16th the German War Office said:

"Further, thirty-seven enemy aeroplanes and two captive balloons were shot down over the battlefield."

Thirty-three air attacks were made during June by the Allies against German towns and cities, according to a statement issued in Berlin on July 17th. Twelve of these were against industrial districts in Alsace-Lorraine and Luxemburg. Four were against the Dillingen and Saarbruecken regions and one each at various places in the Rhine district.

The report admits that slight damage was done to blast furnaces in the Saarbruecken region and at Ludwigshafen, while the damage to private houses is said to be not inconsiderable. Thirty-four persons have been killed and thirty-seven severely injured. Thirty-five others suffered slight wounds.

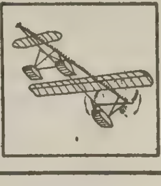
The German report of July 18 says of aerial operations: "Twenty-three enemy aeroplanes were shot down on July 17th."

ITALY

The War Office issued this statement on July 15th: "Six hostile aeroplanes have been downed."

MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

STREAMLINE is another study to which the reader should devote his time, too. To stream line a body is to make it of such form or shape that it will pass through the air with the least possible resistance. This is accomplished by shaping the objects somewhat like a fish. We will take the shark as a perfect streamline body. The nose is sort of blunt, the widest section about one-third the distance back, and gradually tapering to a point at the tail. This allows the shark to move easily through the water, and if this shape is used in the air it is only natural that it is the correct form, because air is thinner than water and a body that will move easily through the water, will move much easier through air.

Figure 1, in the drawings, shows a front and side view of the old Bleriot machine. The reader will notice the lack of streamline throughout the whole machine. In the old days aeroplane designers did not bother much about this problem, they did not even care about enclosing the rear part of the body. The only part covered was the forward part which held the engine, fuel tanks and pilot. This caused a loss of about 50% of the available engine power.

The Nieuport shown in Figure 2 was a new and successful idea in 1911. The body was made deep at the forward section and tapered to a wedge shape at the rear. This little monoplane made a speed record at that time of 68 miles per hour. This showed the designers that it was necessary to cover all exposed parts of the body and cut down the head resistance as much as possible.

The perfect shape for an aeroplane body is shown at Figure 3. This is known as the monocoque type and is constructed from layers of thin veneer wrapped one over the other somewhat like tobacco on a cigar. While this is the perfect shape for a body, the weight is a drawback and for that reason it is not used to a large extent. Our L. W. F. and the German Albatross are machines using this form of body.

The Spad shown at Figure 3 is a fair compromise between the heavy monocoque type and the light built up style in use mostly by aeroplane constructors. It will be noted that there are no sharp corners, and even the cylinder heads have a streamline covering over them. Also take notice to the streamliner directly behind the pilot's head.

This much for the resistance of bodies, we will now take up the proper shape of struts, tail skids, etc.

Figure 5 shows an air stream flowing around a square strut. The reader will notice the air striking the flat entering edge spreads out and curls around closing at the rear and forming a vacuum which holds the machine back.

The strut in Figure 6 has a better shape than the one in Figure 5, and the air passes around it easier, but all the vacuum is not eliminated. Figure 7 is a strut of perfect shape, and you will notice that it passes through the air with very little trouble, the air separating at the front and closing in at the rear without allowing a vacuum to form.

Bracing wires also tend to cut down the speed of the machine, and when you consider that the average areoplane has over 400 feet of bracing wires exposed to the air currents, it is necessary to do something to lessen this resistance. This can be done by the bracing cables and wrapping at distances of about 12 inches with silk ribbon or linen thread and glue, as shown in Figure 8.

Tail planes in ordinary practice are flat top and bottom. A better way would be to put a slight camber on the top. This would not alone be a better cross section but would give enough lift to take care of its own weight. See Figures 9 and 10.

Planes can also be made to conform to the air currents through which they pass. While the general cross section of wings must be of conventional design, the plan of the wings can be made so the air will flow by at the ends with very little friction.

On the left, Figure 11, shows a wing having square ends. Wind tunnel experiments show that air flowing past a wing tends to curve outward at the ends as shown by the lines in the figure.

To the right, Figure 11, shows a wing designed to take care of the air currents; the reader will note that a triangle has been cut out of the end of each wing. This angle that the ends of the wings form is called the "Rake."

Tail skids can also be designed to overcome resistance; the bad and good designs are shown in Figures 12 and 13.

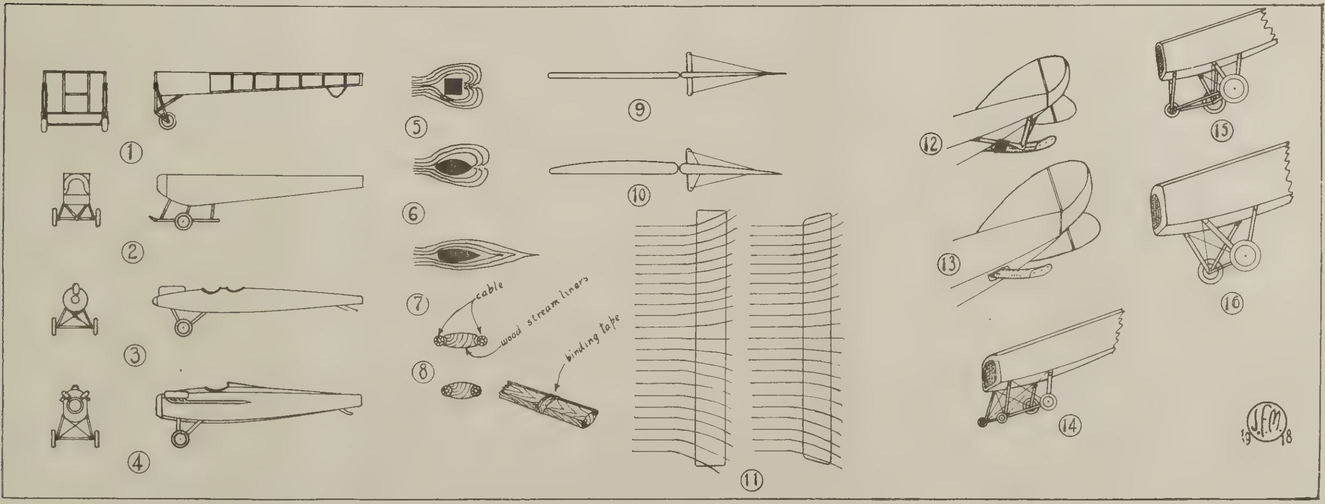
In Figure 12 is a tail skid of poor design because all the bracing is exposed to the air currents. It would be better to insert it in the body of the machine as in Figure 13, leaving only the end of the skid projecting.

Landing chassis are made in different forms and for various reasons. Figure 14 shows a landing gear of the four wheel type. This type offers great resistance, and is generally only found on training machines, as is the three wheeled type, Figure 15.

The best all around and most used type is the one shown in Figue 16. This type is found on most of the fighting machines.

It would be well for the reader to study this article over and to keep it in mind when planning a model or large machine because every pound of resistance needs an equal amount of thrust to overcome it and the faster the aeroplane travels the greater will be the resistance with a corresponding loss in efficiency of Horse Power.

(To be continued)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Censored or Censured

Just suppose that you were a cadet—on the other side—and you came from the same town as the officer over you—and he were in love with the same girl as you. How you would long for a commission, or a new C. O. to censor the letters to the only girl.

All the Same Family

The new recruit walked into the orderly room and made himself at home with the clerks there. "Say, who is the General Staff I hear so much about these days; I see his name in the papers almost as much as General Pershing's. I never heard of him before."

"He's a son of Major Operations," said the Sergeant-Major.

"And a brother to Corporal Punishment," said the post corporal.

"Also a cousin to Private Entrance," said the Orderly Room clerk, as he threw him out. "Didn't you see their names on the door as you came in?"

Aviator Smith: "We are all living on borrowed time."
Aviator Cohen (thoughtfully): "Gee, I wonder if Uncle Sam will charge us interest."

An Enviable Record

"She's a regular Ace."
"I should say so! Bagged her sixth aviator."

"THE BONEYARD"

(With Apoplexies to Kipling's "Mandalay")

1

In the old junk-ridden Boneyard, looking homesick t'ward the field,
There's a poor cadet a settin', with a wrench he's supposed to wield;
For he knows he should be flyin', and the H's seem to say:
Come on up, you Boneyard flyer, take a jazz ride o'er the bay.

Take a jazz ride o'er the bay,
When the air cops are away;
Throw away the wrench and hammer, tell the
Lieut you're sick today.

Take a jazz ride o'er the bay,
Reclamation, it won't pay,
'Cause you smash 'em with a hammer
When you see the Lieut's away.

2

The wings were bent a little, but you made 'em kindlin' wood,
And you sorted brass from copper, 'stead o' flyin' as you should.
Try to work you good an' plenty, but you never do a lick,
'Cause you know you should be flyin' and a fingerin' the stick.

Bloomin' Kadet—out'a luck,
It's to you they pass the buck;
Plucky lot they care for Kadets, when they
Shove 'em in that muck.

Take a jazz ride o'er the bay,
When the air cops are away;
Smashin' wings doesn't get you nowhere,
When you should get flyer's pay.

Take a jazz ride o'er the bay,
Where the cam'ra-gun ships play,
And there ain't no Lieut to watch you
If you whip stall far away.

3

Ship me somewhere from the Boneyard, where the best is like the worst,
And you ain't a poor day lab'rer, and you ain't etern'ly cursed;
For the Curtisses are callin', and it's there that I would be,
Far above that damned old Boneyard, where it can't leer up at me.

Take a jazz ride o'er the bay,
When the air cops are away;
For I'm sick o' rippin' linen,
An' I ought'a fly today.

Take a jazz ride o'er the bay,
Smashin' ship'll never pay;
When I should be doin' spirals
Out there above the bay.

What with the heat and the U-boats and the lightless nights, and the possible air raids, this seems a most appropriate time for a little vacation.

Business of looking for our fishing tackle.

(*Continued from page* 909)

Ham, Mark Neely..........WFO
Harper, Oliver O..........WFO
Haskins, George W..........WFO
Heltzen, William Stanley..........WFO
Heston, Adrain O..........WFO
Hoadley, George J..........WFO
Hollingsworth, John Y..........WFO
Horne, Ernest, G..........WFO
Haines, Allen O..........Note 4

I

Immig, August C..........GLC
Isbill, Paul M..........GLC
Illich, Jerry T..........CJS
Inlow, Walter T..........EOT

J

Jones, Harry V..........FRF
Jewett, Alfred L..........FRF
Jordon, James J..........LDT
Jennison, John C..........FRF
Johnson, Perry Valentine..........SLR; PMT
Johnson, Carl Eugene..........SLR; PMT; FRF
Jones, James S..........LDT
Jackson, Paul C..........EOT
Johnstone, Hugh R..........LHV
Jones, Elmer H..........CWT
Johnson, George E..........LDT
Joyce, Frank..........FRF
Johnson, Bruce..........GLC
Justice, Philip S..........BST
Johnson, Courtlandt S..........PFO
Johnson, Lawrence Strean..........CJS
Jones, Howard T..........CJS
Jamison, Ross P..........WFO
Jenkins, Burris A..........TFT

K

Knapp, Ralph A..........FRF
Kelley, Earl Clarence..........SLR; WFO
Kildall, Edwin O..........SLR; ELA
Kile, Neil E..........DIK
King, Frank LeRoy..........SLR; RSD
Keith, Arthur M..........FRF
Kelly, Sherwin F..........TFT
Kratzer, Henry A., Jr..........DIK
Keller, Clarence K..........FRF
Keeley, James H., Jr..........GLC
Kilroy, Edward A..........RWT
Knight, Emmett Robert..........SLR; CJW
Kelly, John O..........FRF
Keys, Arthur A..........LDT
Kenny, Raymond..........PFO
Kresge, Clyde Lafayette..........SLR; TFT
Krug, Frank W..........DIK
Kilburn, George W..........GLC
Knoche, Frederick E..........LDT
Knowles, John A..........FRF
Keys, John F..........WFO
Kent, Thomas T..........WFO
Keith, Jerome..........WFO
Kilroe, John Charles..........CJS
Kinney, Wallace E..........CJS
Kultge, John H..........CJS

L

Lee, Colin K..........SLR
Larkin, George R..........FRF
Lutton, Robert D..........CAF; DIK
Law, Sidney F..........DIK
Lachmund, Harry G..........FRF
Lawson, Norman..........DMA
Landram, Harry T..........VBW
Lillie, Hiram B..........SLR; CJW
Lea, Royal B..........FRF
Lyle, Samuel P..........LDT
Lister, Harold R..........BST
Littlefield, Harry M..........RSD
Law, Sidney F..........FRF
Leger, John C..........CGC
Lake, Harley W..........FRF
Lee, Cecil Clair..........SLR; RSD
Liepold, August Edwin..........SLR; ELA
Lawrence, Harry Francis..........KST
Linn, Howard..........CPR; DMA
Lewis, James O..........BST
Lawyer, Samuel E..........LDT
Lebensberger, Edgar B..........BST
Leighninger, Robert E. H..........LDT
Luder, Leslie J..........TFT
Leonard, Edgar W..........CGC
Law, Bernard A..........CJS
Leggett, Kenneth C..........CJS
Leonard, J. Cecil..........CJS
Lane, Orlando H..........CJS
Larson, Westide T..........CJS
Leonard John Lawson..........CJS
Liggett, Arthur G..........CJS
Livesay, George B..........CJS
Lundgren, Theodore S..........CJS
Leferink, Richard..........WFO
Lienesch, Charles F..........WFO
Lovelace, Lake..........WFO
Liles, Fred Columbus..........SLR; CAF

Mc

McGinnis, Louis R..........FRF; SLR; AAD
McNamara, Laurence J..........FRF
McCartney, Roy E..........FRF
McCullough, Henry Ferree..........SLR; CAF
McKay, Harold Alexander..........SLR; WFO
McKnight, Roy Alfred..........SLR; WFO
McFerren, Francis A..........EOT
McGinley, John J..........CGC
McMullen, Clements..........RSD
McNeil, Horace J..........RSD
McLaughlin, John G..........LDT
McClure, Colin B..........DIK
McClymond, Ernest Leroy..........SLR; SFT
McGraw, Leroy E..........UTA
McBride, William Wallace..........SLR; AAD
McGovern, Edward Thomas..........SLR; KST
McKenzie, Clyde C..........TFT
McCabe, Roscoe E..........WFO
McBride, Howard I..........WFO
McMurphey, John W..........WFO
McCormick, Ralph C..........CJS
McGehee, Abner Frances, Jr..........CJS
McGrath, Michael Francis..........CJS

M

Morehart, Malcolm B..........VBW
Moody, Alvah E..........FRF
Miller, George E..........SLR; DIK
Mayo, Robert C., Jr..........FRF
Macomber, Henry W..........FRF
Mooney, Horace W..........FRF
Mick, John R..........VBW
Mulcahey, Edward P..........FRF
Mann, Adolph H..........DIK
Monteith, Darrel M..........FRF
Maxwell, Fred Clair..........SLR; HHN
Murphy, Dan W..........PWM
Meyer, Jerome Gustave..........CRI
Morner, Edward Clyde..........SLR; WFO
Meyer, Philip Randolph..........FRF; SLR; KST
Marsden, Ross S..........DIK
Moll, Norman L..........FRF; DIK
Mensch, Sterling R..........DIK
Mehlhop, Thomas Pope..........SLR; BFT
Mills, Davis Whitmore..........SLR; HHN; FRF
Maxim, George W..........GLC
Miner, Vern E..........DIK
Mercer, Parish D..........DIK
Metcalf, Manton B., Jr..........LDT
Moser, Harry V..........LDT
Mann, Adolph H..........FRF
Middleton, Irvin B..........BST
Morehead, Hobart E..........DIK
Morthland, Merle A..........FRF
Morris, Harley..........EOT
Mackenzie, William J..........FRF
Millard, Joseph H..........EOT
Moore, David H..........GLC
Madden, John H..........CWT
Myers, Carl Hiestand..........SLR; RWT
Murray, John G..........FRF
Milburn, George J..........LHV
Mann, Lawrence C..........DMA
Morgan, Marion H., Jr..........FRF
Mahaffie, James E..........SLR; FRF; AAD
Markley, John W..........FRF
Mills, Robert R..........EOT
Murphy, Cyrus W..........FRF
Mowry, Jared James..........SLR; TFT
Massey, Bert V..........BST
Morearty, Charles Bryan..........SLR; FOB
Miller, Edward A..........PFO
Maloney, John P..........LDT
Miller, Julian F..........LDT
Muller, August F., Jr..........LDT
Mason, Clesson Ernest..........SLR; HHN
Morris John P..........LDT
Molan, Charles L..........LDT
Martin, John H..........DIK
Miller, Walter Hugh..........SLR; GLC
Midyette, Dayton Ralph..........CJS
Morris, David B..........CJS
Moores, Kenneth A..........CJS
Morgan, Herbert Peyton..........WFO
Morrow, George Dwight..........WFO
Martin, Charles A..........TFT
Morrow, Wade..........TFT
MacMechan, Dunbar Dene..........CJS
Markel, Charles H..........TFT
Matthews, Robert H..........TFT
Marinoik, Joseph A., Jr..........WFO

N

Newman, Augustus L..........FRF
Nielsen, Gustaf A..........VBW
Nevin, John, Jr..........TFT
Nestor, Charles W..........VBW
Noyes, Charles M..........FRF
Neal, Homer S..........CGC
Noyes, Edgar T..........DIK
Neubauer, George R..........FRF
Naumann, Arthur P..........FRF
Nash, David Moulton..........SLR; WFO
Nelson, Clyde K..........DIK
Norris, Fred P..........DIK
Nunn, James D..........CJS
Nichols, Brayton..........TFT

O

Orand, David H..........FRF; DIK
Olmstead, Charles H..........VBW
Owen, Ralph Cartwright..........SLR; KST
O'Leary, Christopher C..........FLR
Oliphant, Rufus A..........FRF
Owen, James Porter..........SLR; CFT
O'Neil, Joseph H..........LHV
Olson, Carl N..........EOT
Oswald, Fred..........DIK
O'Gorman, William S..........CJS

P

Phelps, Ralph M..........FRF
Pardridge, Clinton E..........FRF
Prettyman, Lee..........FRF
Perry, Merrill G..........VBW
Peterson, Frederick R..........FRF
Pardy, George W..........GLC
Pemberton, George H..........BST
Pearson, Russell Howe..........SLR; SBI
Paige, William J..........LDT
Price, John Morgan..........SLR; PFO
Pinckney, Jerald J..........FRF
Perry, William L..........FRF
Post, George B., Jr..........CGC
Pilcher, Rufus J..........CWT
Perry, Ralph W..........VBW
Patterson, George B..........WFO
Pope, Harley H..........CVS
Perry, Gronway Robert..........SLR; KST
Palmer, Sumner C..........RSD
Parker, Roy C..........RSD
Parsons, C. W. Stanley..........RWT
Phelps, Robert L..........WFO
Pope, Arthur B..........WFO
Payne, Bryan W..........PMT
Palmer, Hubert P..........WFO
Pennewill, John M..........WFO
Power, Hugh C..........TFT
Pitrat, Charles S..........CJS
Pence, Ferris E..........TFT

R

Riley, Sidney A., Jr..........FRF
Rogers, John B..........FRF
Rogers, Franklin L..........FRF
Robson, John M..........VBW
Reese, Francis S..........DIS
Rawn, Ira L..........VBW
Rose, Joseph W..........FRF
Reed, William G..........CPR
Rothe, Roland J..........VBW
Reeve, Orson L..........FRF
Ross, Lucius G..........FRF
Rauh, Joseph A..........LDT
Reed, John Seaver..........CRI
Rabbitt, Ora C..........EOT
Root, Homer B..........EOT
Rhoads, Tilford W..........EOT
Robbins, Lee R..........GLC
Reddy, Philip J..........CGC
Rees, Lucius C..........BST
Rombough, Miles Donbar..........SLR; RSD
Rice, George E..........FRF
Rothstein, Arthur..........DIK
Ransom, Harold B..........EOT
Rummel, Jay A..........EOT
Ross, Julian K..........FRF
Ritchie, William J..........FRF
Raiguel, William O..........DMA
Regan, Harold J..........BST
Riblet, Philip D..........FRF
Ross, Harry Olaf..........SLR; EOT
Redman, Ernest A..........CJS
Russell, Horace W..........DIK
Ratcliffe, Fred A..........DAP
Richardson, Fred S..........RWT
Russell, Oscar V..........FRF
Russell, Franklin B..........CWT
Rowe, Elmer C..........FRF
Reynolds, Robert F..........RSD
Royer, David A..........RSD
Rothfeld, Lawrence..........LDT
Robinson, Ralph R..........FRF
Ratcliffe, Kent E..........CJS
Reavis, Carlos L..........CJS
Ricciardi, Attilio..........CJS
Reed, Edward E., Jr..........WFO
Richelieu, William V..........CJS
Roberts, John J..........TFT
Reis, John B..........TFT
Reavis, Charles F., Jr..........PMT
Rodenbaugh, Albert I..........CJS
Raibourn, Claude..........FRF
Reed, Carroll C..........WFO
Richards, Walter E..........WFO
Roberts, Ray C..........WFO
Rabenstein, Waurel K..........WFO
Robertson, Allen W..........WFO
Rolleston, Mareton M..........WFO
Redding, Robert David..........SLR; Note 7
Reichert, Edward Tyson, Jr..........SLR; Note 7
Roche, Felix R..........Note 2

S

Stevens, Walter H..........FRF
Stouffer, Samuel M..........VBW
Stein, Louis H..........VBW
Silverman, Michael M..........FRF
Sides, Jacob S..........FRF
Scott, Hally M..........SLR
Shreeve, Herbert E..........MJR
Smails, William H..........VBW
Saunders, Irving M..........FRF
Sweinhart, Victor C..........CPR
Smoch, Harold E..........FRF
Stanton, Lewis G..........FRF
Schmidt, Victor..........TMA
Smith, Orus W..........TMA
Schumacher, Charles H..........TMA
Stephenson, James Raymond..........SLR; TFT
Sparks, Bayard Preston..........SLR; SBI
Sullivan, Charles B..........FRF
Scull, Leo Navens..........SLR; BFT
Stone, L. Leonard..........SLR; SMM
Sheriden, Hiram Wilson..........SLR; GLC
Schlipf, Albert C..........LDT
Smith, Harrison P..........LDT
Steele, Cyril H..........LDT
Strawn, Paul A..........LDT
Sampter, Herbert C..........LHV
Simpson, Thornton G..........VBW
Seliff, Robert E..........GLC
Sheetz, Jack F..........LDT
Smiley, James H..........LDT
Snyder, Floyd..........LDT
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Sargent, Carl A..........FRF

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Tool, Frank L.	VBW
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Thompson, Franklin S.	FRF
Thomas, Charles B.	FRF
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Taylor, Bayard Campbell	SLR; CFT
Towner, Bob G.	FRF
Thompson, Harry S.	DIK
Thompson, Arthur F.	LDT
Thierbach, George C.	EOT
Tobian, William	FRF
Tieman, Frederick A.	DIK
Thompson, Herle A.	EOT
Trantham, Homer	PFO
Tupper, Preston E.	LHV
Todd, Edwin T.	LDT
Tips, Eugene C.	LDT
Talbot, Elmer R.	BST
Tell, Arne W.	TFT
Trotter, Harold E.	TFT
Tatnall, Emmett R.	DMA
Thomas, Roy A.	WFO
Talbot, William C.	CJS
Thompson, Harwell C.	TFT
Tillish, William H.	CJS
Tefft, Lionel Vitor	WFO

V

Vendig, Morales C.	LDT
Vought, Donald W.	VBW
Von Eiff, Herman A.	FRF
Vinton, Benjamin	PFO
Veach, Thomas F.	DMA
Verbeck, Howard G.	FRF
Veblen, Elling H.	WFO
Vessey, Burton F.	WFO
VanHorn, John W.	CJS

W

Waite, Herbert E., Jr.	FRF; BST
Wensley, William R.	FRF
Williams, Edward B.	DIK
Webb, Clyde L.	VBW
White, Charles W.	FRF
Whisler, George H.	FRF
Winter, Henry C.	FRF
Weightman, John A.	FRF
Walker, Stephen P.	FRF
Whitall, John	FRF
Weinspach, Louis C.	TMA
Wright, John Brandon	DIK
Wright, John R.	FRF
Wine, Edward Alden	SLR; WFO
Williams, Paul B.	FRF
Warren, Francis Emory	SLR; WFO
Wait, Harry W.	LDT
Whitman, John B.	LDT
Whittier, Burton H.	RSD
Williams, Herschel O.	RSD
Warde, Wilfrid Brougham	SLR; CAF
Watkins, George H.	DIK
Wilford, Robert M.	BST
Whitall, John	FRF
Wentworth, Harold S.	LDT
Williamson, James C.	LDT
Whiteside Rush Strubing	SLR; TFT
Webster, Lewis S.	BST
Wimer, William B.	EOT
Whitten, Lacey R.	LHV
Williams, Paul K.	EOT
Whitten, Lyman P.	EOT
Wardell, Charles H., Jr.	PFO
Wirkle, James R.	DIK
Wendell, Lay A.	GLC
Wagoner, George A.	GLC
Walker, Roy M.	DIK
Whiting, Brian F.	LDT
Winkle, William E.	LDT
Webster, William P.	PFO
Ward, Eugene B.	TFT
Wiedemann, Duncan R.	TFT
Wentz, Walter W.	TFT
Womble, Claudius W.	WFO
Westcott, Reuel Rufus	CJS
White, Oscar	CJS
Whittaker, Arthur L.	CJS
Williams, Luther B.	CJS
Woodard, James W.	CJS
Wiggen, Mehemet	CJS
Wood, Warren C.	PMT
Watterworth, Earle J.	WFO
Wakefield, Milton H.	WFO
Waller, Alfred Evans	WFO
White, Harold A.	WFO
Whittle, Amos B.	WFO
Wolcott, Henry N.	WFO
Walden, George S.	Note 5

Y

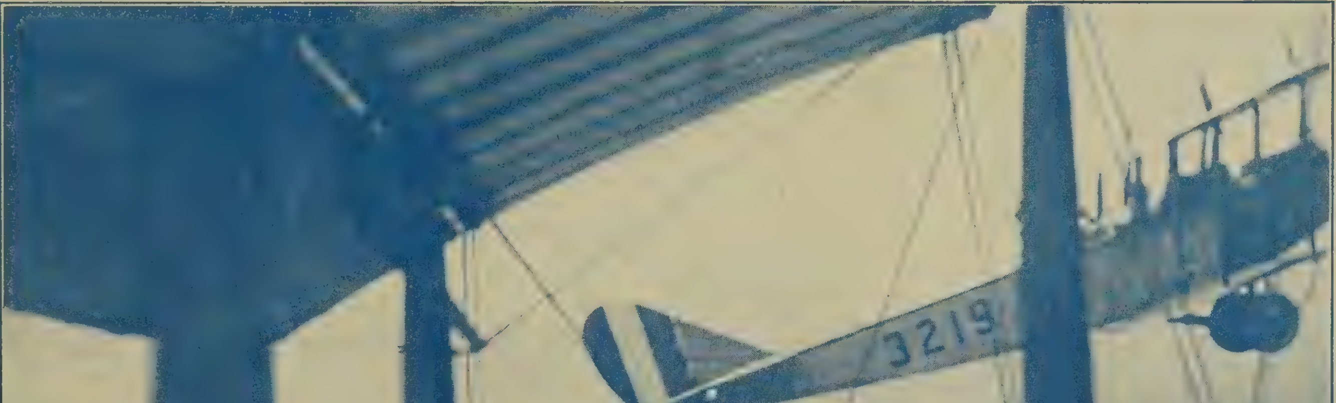
Yates, James W., Jr.	TMA
York, Philip S.	PFO
Youngs, Grover A.	FRF
Yost, Paul K.	DMA
York, Duke A.	BST
Young, B.	EOT
Yackey, Wilfred A., Jr.	FRF
Younger, John E.	LHV

Z

Zaiss, Leonard C.	RSD
Zettel, Raymond Carl	SLR; WFO
Zanetti, Silvio	SLR; KST
Ziegler, John W.	CJS

AERIAL AGE
WEEKLY

Vol. 7, No. 21 AUGUST 5, 1918 10 CENTS A COPY



One aeroplane photographed from another. These two machines flying in formation are about fifteen hundred feet above the ground. There are probably other machines in the formation which are not visible in the picture. No matter how close together the planes fly the only way of intercommunication is by signal, owing to the roar of the motors

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WEEKLY

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GENERAL BRANCKER STATES ALLIES' AERONAUTIC NEEDS

ALTHOUGH the Allies have the ascendancy in the air, the possibilities of aerial warfare are yet far from realization, and an aerial offensive on a grand scale carried to cities of Germany remote from the battleline, including Berlin, is in the realm of certainty in the not distant future, provided the Allies co-ordinate their resources. This is the conviction of Maj. Gen. W. S. Brancker, Controller General of Equipment of the British Air Ministry, who has been in this country several weeks in consultation with Government officials in charge of aviation.

General Brancker, in a statement on July 27 to The Associated Press on this subject, laid strong emphasis on the necessity for the organization of the air forces on a basis independent of the land and sea organizations. This was forced upon the British Government, culminating last January in the creation of an Air Ministry, which now has Lord Weir at its head.

Urges Air Ministry for United States To Co-ordinate Effort and Relieve Executives Now Overburdened

Eventually, General Brancker believes, the United States will be obliged by the pressure of military necessity to create a Secretary of Air Forces, or the equivalent, under whom air fighting, aeroplane production, equipment, and personnel will be a separate branch of combat, just as the army is. For the success of the Allied cause, he feels strongly that the quicker independence of the air forces is established in this country the better.

Favors Separate Aerial Operations

Another vital step to be accomplished, General Brancker believes, is the co-ordination of the operations of all the Allied air forces beyond those required for the respective armies and navies as an independent offensive force under the Supreme War Council, just as the Allied armies and navies are co-ordinated.

"We simply had to come to an Air Ministry in England," said General Brancker. "The Zeppelins and the Gothas, coupled with the experience gained when aviation was controlled by the army and navy, forced it upon us. Public sentiment demanded it. You have had no Hun air raids in this country to arouse you, but it is my hope that, lacking this stimulus, you will profit by our experience and begin at once on an even basis with us in this matter instead of waiting for public sentiment to push up from the bottom, as in our case.

"Are not the advantages of independent control obvious? Here you have one branch of aviation under the administration of the Secretary of War, another under the Secretary of the Navy. These administrations have many other affairs to attend to in addition to aviation. They have subordinates in charge, and there is an Aircraft Production Board, but it is obvious that certain general problems must come before the Secretaries for decision which they would be much better able to pass upon if aviation were the exclusive function of their offices.

British Air Ministry's Decisive Work

"In Great Britain we have Lord Weir, the Air Minister, as head of a council of seven; a Vice President of the council corresponding to your Assistant Secretary of War or the Navy; a Chief of Air Staff, equivalent to the First Sea Lord or the Chief of the Imperial General Staff; a Master General of Personnel, equivalent to your Adjutant General; a Director General of Equipment, the same as the Quartermaster General and Master General of Ordnance or the Third and Fourth Sea Lords; a Director General of Aircraft Production, and an Administrator of Works and Buildings.

"This council controls everything pertaining to aviation, both for land and sea combat. It supplies the army and fleet with aeroplanes and pilots, and in addition maintains an independent force.

"This independent air force really has the same status as the Expeditionary Force or the Grand Fleet. For instance, if the army contemplates an operation on the Belgian coast, the Chief of the General Staff consults with the First Sea Lord as to the extent to which the navy can co-operate. The same procedure will now be followed regarding the co-operation of the independent air force with the army in the field for any particular operation. The navy might say to the army that it did not have enough ships to spare for the enterprise, so the air force might say to the army that it did not have enough aeroplanes for the enterprise beyond those already allotted permanently for army requirements.

"You see, we are quite independent. We can formulate policy and strategy, while production, equipment and personnel function under one control. We do not have the anomalous situation of one branch of aviation service competing with the other for production and equipment. Such co-ordination as this, obviously, is the only way a great air offensive can be prepared for and conducted.

Bombing of Berlin Depends on Delivery of Liberty Motors in Quantities

"We need your help, your great resources and a similar organization in this country to co-operate with us on equal terms. It is within the realm of certainty that we can bomb Berlin in the Spring, if not in the Fall, with aeroplanes which we have building, as we have already bombed Cologne and the Rhine cities, but we have not the numbers for a really big offensive, in my understanding of the term. We have plenty of aeroplanes and can build plenty more, but we lack engines, and we have about reached the limit of capacity for engine production.

"We have built up a big aeroplane program to take the Liberty motor and bomb Germany, but America cannot now spare these motors, and so I fear that our aeroplanes will be wasted and the real offensive from the air seriously delayed.

Flying Aeroplanes Across Atlantic Possible

"The delivery of certain types of aeroplanes by flying them across the Atlantic is feasible. If we can fly to Berlin and back, which is more than 800 miles, we can fly from Newfoundland to the Azores (the longest lap of the journey) which is 1,200 miles. This means a big organization, aerodromes and repair plants in Newfoundland and the Azores.

"Your air forces ought to be organized on a tremendous scale, and this is what we look to America to do."

SEND EVERY MOTOR YOU CAN, SAYS WEIR

Head of the British Air Board Compliments Our Machines and Our Aviators

An appeal from Lord Weir, head of the Air Board in London, for the United States to send the British Air Force "every motor you can" was read by Major Gen. W. S. Brancker, Controller General of Equipment in the British Air Council, at a luncheon given in the General's honor yesterday.

Referring to the fact that the British had brought down 4,106 enemy planes in the last twelve months, against a loss of 1,217 British machines, Lord Weir said the ratio of British superiority is growing very fast in all directions of air activity.

"For some time," he continued, "the United States development program has been on a thoroughly sound basis and founded on a strong and definite policy.

"America must not be impatient at delays which are perfectly normal. Here we now gratefully acknowledge the quality, the capacity, the modesty and the bravery of her pilots and the excellent material of her mechanic personnel. Finally, the Liberty motor is of the very highest value, and America is justified in pushing her output to the greatest possible extent with the fullest conviction that its value to the Allied cause will be remarkable in character."

The luncheon, given by Geoffrey Butler, of the British War Mission, was attended by Americans prominent in aviation. Major-Gen. Brancker flew to New York to attend the affair from a Long Island aviation field.

Our Army of the Air

(*Editorial in New York World*)

If the trained aviator is of no military use without a machine, it is equally true that the machine is of no use without skilled operators. Public attention in respect to this branch of the country's service in the war has hitherto centred upon the machine and its production, and more especially upon alleged deficiencies in its production of whatever type. The *World* in an article on another page presents the first of a series dealing with the man-side of the country's achievement for prosecuting the war in the air.

It is a wonderful story. The Air Service alone of the United States Army is now bigger in numbers of men, officers, equipment and branches of organization than was the whole Regular Army when the United States entered the war. Through Kelly Field, near San Antonio, Tex., there have passed in training during hardly more than a year 114,455 officers and men—what would have been considered before the war a large army in itself for land fighting.

Kelly Field is a practical primary training school for which there are numerous universities, as it were. There men are taught how to fly, and the course is longer and more arduous than is required by any of the other Allies in the war, and it is growing longer. When the student has completed his course at Kelly Field he proceeds somewhere else to specialize in scout-planing or pursuit-planing or bombing or battle-planing. And along with these main branches of the Air Service of the army go numerous attendant and necessary occupations the practical beginnings in which help make of Kelly Field alone a city of 40,000 people, built in a year on an investment of $20,000,000.

There is pouring through these great aviation schools and toward the battle-front such an army of trained men as will presently make the Air Service of the United States greater than that of all the other Allies combined. What have we been doing to help win the war? Here is one slight answer to the question.

Good Advice

The Kelly Field Eagle comes out in bold face type with the following. It is intended to discourage the circulation of those senseless rumors which get about so rapidly. These rumors are part and parcel of the German propaganda in this country.

If you can't make a clear, unmodified statement that you are willing to take chances of being called a liar for—and then giving the accuser a forced diet of his own words—SHUT UP!

This "I heard," and "They say," stuff not only is proof conclusive that you have a poached egg for a brain, but it is Old Dame Rumor's entire and exclusive source of sustenance. And the old girl is the Kaiser's one and only faithful love.

Prattling tongues and rattling brains make the same kind of a racket and besides getting you in bad—yes, even to the 'hoosegow'—they constitute, in nine cases out of ten, pro-Prussian propaganda. The Germans care not a bit what you talk about—you can serve them by just talking about nothing. These air castles have been and are being substantially built without any foundation.

When you hear something which might be interesting if true, buckle your chin-strap a little tighter and trace the grapevine to its root. The hat-hobble may thus save your head also. When you have found the originator of your Prussian-blue mirage, if it's true, congratulate him; if it's a lie, knock his block off!

Major C. K. Rhinehardt, J. M. A. (Sunshine Rhinehardt) the energetic Commanding Officer of the First Provisional Wing, which occupies a score of flying fields on Long Island, with headquarters at Hazelhurst Field, Mineola, who has done much efficient pioneer work in military aeronautics

The News of the Week

Flight Over Sea Likely This Year

London.—Joseph Handley-Page, the manufacturer of the famous bombing aeroplane that bears his name, is of the opinion that the $50,000 prize for a flight across the Atlantic may be won this year. In an interview in the *Daily Mail* he says:

"I am certain the flight could be made and the prize won, giving our present machines as developed by the war and the experience in flying of our military and naval forces, if we were not kept so busy manufacturing aeroplanes for war purposes.

"The first attempt to fly from America to Europe will be made from Newfoundland owing to the contour of the North American Atlantic Coast line. A successful landing probably will be made on the Azores and thence to Portugal or possibly direct to Ireland.

"All aeroplanes nowadays are coming toward France, not going away from it. One of our Handley-Page machines made in America would not be materially damaged or its fighting value impaired by making the flight from America. All things considered the flight should be made and the prize won in 1918."

Bombers Knew of U. S. Hospital

Some of the details of the aerial bombing of the American Red Cross hospital at Jouy on July 15th are at hand and show that the operations of the Germans were carried out with deliberate planning and purpose. At 11 o'clock that night the Germans dropped four bombs on the buildings, killing two orderlies, mortally wounding nine others and seriously wounding a Red Cross nurse. Nine American soldiers who were recovering from wounds were injured again.

The grounds of the hospital are marked by a great white cross, visible thousands of feet in the air on moonlight nights. Maps found upon German prisoners showed the location of the hospital marked by an X, indicating that it was common knowledge with the enemy where the hospital was situated.

Investigator Kellogg in Dayton Aircraft Probe

Dayton, Ohio.—The aircraft production inquiry, under the direction of the Department of Justice, which is in progress here, took a new turn with the arrival from Washington of N. W. Kellogg, nationally known as an investigator. The veil of secrecy which has encompassed the inquiry thus far was drawn still closer today with Kellogg's arrival. Mr. Hughes again declared that nothing will be made public of the committee's finding in the aircraft inquiry until President Wilson, having been given the report, makes it public. There are indications that the investigation may continue through this week, the Attorney General and Mr. Hughes apparently having decided to remain here until a full inquiry is completed.

Seven in Battle Flight to Philadelphia

Mineola, L. I.—Seven aviators of the First Provisional Wing unit, who have volunteered to fly the first fleet of bombing machines across the Atlantic, began on July 17 a series of long-distance flights in battle formation by flying to Philadelphia from the army aviation field here. It was their intention to fly back to their field the same afternoon, but mishaps to two of the machines upon landing and the bad flying weather reported by the New York-Washington aerial mail fliers caused the dispatch of orders for them to put their machines in hangars to await better weather. Permission was also given them to fly over Philadelphia in practice observation.

Most of the aviators in the Provisional Wing have already made several long-distance cross-country flights, but they had not flown long distances in battle formation. They have been practicing in the formations for several weeks and have flown over New York City in their battle evolutions on the Fourth of July, Bastile Day, and over the funeral cortege of Major Mitchel. Because of the difficulty of retaining the exact formation at great speed, the aviators have been training slowly, and it was not until today that the instructors here decided that the men should retain their unit formation in a long flight. In their other flights they had taken battle formation only over the city, and had flown to and from the field as individual machines.

One of the secondary objects of the flight was to enable aerial observers in the planes to pick out sites for landing fields for the New York-Washington aerial mail, so that the machines may have clear spaces to land when they have engine trouble. The observers were ordered to make maps and photographs during the flight for the postal authorities directing the aerial mail.

Other longer flights will be taken by the Provisional Wings to train them for bombing expeditions, reconnoissance, air fighting, and patrol duty, as well as for the proposed Atlantic flight. Some of the other flights may be made in the American-built Caproni and other large planes, while a formation flight may be made later with the Caproni and the huge Handley-Page bombing machine that aviators from the army fields here are studying now at Elizabeth, N. J., with a squadron of the smaller battle-planes as guards.

Lieut. James Armond Meissner, the newest American Ace; he brought down his fifth (5th) German Aeroplane on the 8th of July. He formerly lived in Brooklyn, N. Y.

Putnam Brings Down His Eleventh Machine —Allies Maintain Aviation Lead

Mineola, L. I.—Army officers in command of the aviation fields here have practically abandoned wire and rail communication with the War Department in Washington and most of the official business with the capital is dispatched by aeroplane. Aviators at the field consider a flight to Washington a mere jaunt, and Major C. K. Rhinehardt, the commanding officer, an expert aviator himself, never makes a trip by train. He flies to Washington in any make of plane available at the field.

Will Support La Guardia

The National Security League has announced that it will support for re-election in the Fourteenth Congressional District Representative Fiorello H. La Guardia, now a Captain in the Aviation Corps in active service on the Italian front.

New British Aeroplane

London.—The newspapers on July 19 gave prominence to a report of a new type of British aeroplane, which, having been tested at the front with the greatest success, is about to be employed there in large numbers.

No technical details are given, but it is said the new machine has enormous speed and climbing power. It is capable of carrying great weight in bombs, machine guns, and other equipment, and of attaining a height of 20,000 feet in an astonishingly short time.

It is said the machine can cover long distances at a speed which leaves all but the fastest modern scouting machines far behind, and thus is able to cross the enemy's lines and drop bombs and return for a fresh load within a time limit far less than any of the earlier aeroplanes.

The engines of the aeroplane are declared to be so completely reliable that risk of compulsory descent into the enemy's territory is eliminated. It is added that not one of these wonder machines has yet been downed, notwithstanding the utmost efforts of the Germans.

New Uniforms for British Aviators

The creation of a new uniform has been announced for the British Air Force, into which the Royal Naval Air Service and the Royal Flying Corps have been merged. The new uniforms are to supersede the old uniforms of the Royal Naval Air Service and the Royal Flying Corps as soon as possible, according to the order of the British Air Council.

The service dress of the Air Force during the war will be khaki, but after the war a uniform of the same pattern but of a light blue color will be substituted. Officers are allowed to wear the blue during the war.

The rank of officers will be distinguished by upright bars on each side of the badge of the cap, one bar for a second lieutenant and first lieutenant, two for a captain, one row of gold leaves for field officers and two rows of gold leaves for general officers.

The style of the uniform itself includes all of the best features of the old uniforms of the Royal Naval Air Service and the Royal Flying Corps.

Austrian Mail Plane Crashes; Two Die

According to a dispatch from Amsterdam the new Austrian Aero Mail is having troubles of its own. The dispatch says:

A biplane carrying mails between Budapest and Vienna fell from an altitude of 2,000 feet, according to advices received here. The two occupants of the machine were killed.

French Ace Will Make Detroit-Chicago Flight

Chicago.—Lieut. Georges Flachaire, a French ace with a record of twelve German planes brought down, announced on July 11th that he would go to Detroit and fly from there to Chicago in his Spad machine, a late type of French fighting machine. The lieutenant said he expected to make the flight from Detroit in less than four hours.

Aviators Kill Two in American Hospital

Paris.—German aviators dropped bombs on the American Red Cross Hospital at Jouy. Two enlisted men were killed and among the personnel nine persons were wounded. Miss Jane Jeffery, an American Red Cross nurse, was among those wounded, although her injuries are not serious.

The hospital was deliberately bombed by the German aviators. It was full of wounded at the time and doctors were performing operations at four tables. The operations continued, notwithstanding the explosions.

At least three bombs were dropped on the hospital. One destroyed three tents. Additional doctors were telephoned for immediately and work at the hospital was continued without interruption.

Mr. Val Fisher and his daughter

Mrs. Harry Bowers Mingle, wife of the president of the Standard Aircraft Corporation, who christened the first American built Handley Page bombing air cruiser.

Mr. Val Fisher

Mr. Val Fisher, who recently arrived in America to take up propaganda work for the British Government; Managing Director of *Advertising World,* foremost advertising trade paper in Europe; organized first International Exposition of World's Advertising Methods in London, 1913. He has many friends in American publishing and advertising circles, through his previous visits to the States and through the work of the Information Bureau on Advertising, which he founded in 1910. The services of this Bureau have been of immense value to British firms extending their overseas trade and to American firms commencing operations in the European market. Val Fisher is a member of the London Chamber of Commerce and Associate Member of the American Chamber of Commerce in London, and a strenuous worker in the development of Anglo-American trade. His unique knowledge of the world's advertising and selling methods has always been at the free disposal of British and American advertisers.

In 1915 Val Fisher joined the Royal Air Service, and after two years flying and coastal work in the British Navy his services have been requisitioned by the British Ministry of Information.

Mr. Fisher reached New York on Independence Day, after an exciting voyage, during which the convoy was repeatedly attacked by the U boats. A torpedo aimed at the boat on which he was traveling struck and sunk another vessel, and in the engagement which followed the British destroyers accounted for two U boats. He will make New York his headquarters and visit the principal cities of the States.

With the American Army on the Aisne-Marne Front

For the second time since the big battle began the weather interfered with operations, especially in the air. The afternoon of July 26th was cloudy most of the time, with local showers frequently drenching the fieds and forcing the aeroplanes to descend.

Before the work of aerial observation and bombing was ended, however, one American aviator, Lieutenant Avery, succeeded in forcing down alive within the American lines a German Captain who had a record of sixteen victories over Allied aviators. Another American, near Villeneuve, also brought down a German plane.

Lieutenant Pietro Rocia, of the Royal Italian Air Service, now in this country.

Press Dispatches About American Aviators

With the American Army in France.—Two more German aeroplanes were reported to have been brought down July 20 by American aviators. Neither report has been confirmed officially.

One of the enemy machines was brought down by Lieutenant David E. Putnam of Massachusetts. Lieutenant Baker Brody Freeman engaged in a fight with a German biplane and tumbled him to the ground.

Paris.—Sergeant James A. Connelly of Philadelphia is cited in the official journal of July 24 as an air pilot of remarkable adroitness. Sergeant Connelly has downed two enemy aeroplanes.

With the American Army in France.—Lieutenant Warren T. Hobbs of Worcester, Mass., a member of the Lafayette Flying Squadron, is officially reported as missing since July 17 folowing an air fight.

With the American Army in France.—Owing to the fact that July 24 was bright and there was litle wind aviators played an important role in the fighting. The newspaper correspondents witnessed to-day an aerial engagement in the Chateau Thierry front, in which the enemy was driven off. An enemy aviator appeared over two observation balloons. The anti-aircraft gunners saw him and let loose scores of shrapnel shell above him. In less than three minutes two French planes went to the rescue of the balloons, but the German declined to fight.

Nose diving directly through the rain of shells, he righted himself and flew away before the anti-aircraft guns could swing upon him or the slower flying planes could get at him.

American aviators in combats north of the Marne on Wednesday downed five German machines. The Americans suffered no losses. Their first fight was with a German squadron of twelve planes, the battle lasting nearly two hours. Four Germans were downed. Later the Americans shot down another enemy plane.

Lieut. Col. C. G. Woodwark

COLONEL WOODWARK, who recently arrived in New York on an important mission for the British Ministry of Information, is one of the best known men in the East of England. Born in Kings Lynn, Norfolk, he is a member of the borough council, director of the Kings Lynn Dock & Railway Company, military member of the Norfolk Territorial Force Association, Vice-Consul for France in East Anglia, prospective candidate for the Imperial Parliament, representing his native district, prominent member of the National Sporting Club, well-known exhibitor and judge of English sporting dogs.

The Colonel has held a commission in the Norfolk regiment for twenty-one years, and has been on active service since the day war was declared. In the first few weeks of the war he raised and organized two battalions of the Norfolk regiment, recruiting over 5,000 men. He commanded a battalion of the line in France for two years, and at the end of 1917 was invalided home with shell shock. After a lengthy spell in hospital he returned to East Anglia and organized the Eastern command army labor center, consisting of 15,000 men. After a further spell in the hospital he joined the staff of the War Office, which position he relinquished to visit his country.

Colonel Woodwark was one of the first men in England to recognize the necessity of extending a cordial welcome for American troops landing there. As a result of his efforts, troops were met by bands and given a rousing welcome. Through influence the National Sporting Club organized an American night each week. Through Colonel Woodwark the greatest sporting club in England is reserved entirely for American fighting men. Some fine programs are gone through. Traveling concert parties, moving picture and boxing shows, etc., are sent the rounds of American training centers, and in every district where American troops are quartered the local people are vieing with each other in making the stay of our boys as pleasant as possible.

The Colonel, who is visiting New York for the first time, expresses himself as overwhelmed with the hospitality shown him.

As an experienced commander he is of the opinion that the American aviators and troops who landed in Europe are second to none in physique and appearance, and from the way in which the English and American soldiers fraternize in both France and England he is convinced the war has done much to cement even more firmly than before the bond of sympathy between the two great English speaking nations.

Though not an aviator himself, Colonel Woodwark has been very much interested in aeronautics and is taking a keen interest in the building of the American Air Forces.

House Naval Committeemen "Over There"

Washington, D. C.—Secretary Daniels announced Friday, July 26, that the members of the House Naval Committee who left last week for a tour of inspection of naval activities abroad have landed at a British port.

"The members of the House Committee," said Secretary Daniels, "will visit our naval and aviation bases abroad, make a general inspection of our naval activities, and inquire into the needs of the service. We are necessarily spending large sums to develope our European stations, which are operated in conjunction with the British, French and Italian navies, and the Congressmen who are charged with the duty of providing the necessary appropriations wish to see for themselves what is being done and what future provisions should be made."

"Assistant Secretary Roosevelt is already in England, and will co-operate with the members of the Naval Committee, as will also Admiral Sims and the other American naval authorities in Europe."

The members of the House Committee in the party are Chairman L. P. Padgett, of Tennessee; D. J. Riordan, New York; W. L. Hensley, Missouri; J. R. Connelly, Kansas; W. B. Oliver, Alabama; W. W. Venable, Mississippi; J. C. Wilson, Texas; T. S. Butler, Pennsylvania; W. J. Browning, New Jersey; J. R. Farr, Pennsylvania; S. E. Mudd, Maryland; J. A. Peters, Maine; F. C. Hicks, New York.

Lieut. Fonck Downs Three More

Paris, July 27.—Three new aerial victories for Lieut. Fonck, bringing his total to 59, are reported.

The newspapers say that Adjutant Ehrlich has won ten aerial victories in exactly twenty-five days.

Hydroaeroplane Kills Critic in His Boat

Gustav Kobbe, the music and art critic of *The New York Herald*, was killed instantly on July 28, when a naval hydroaeroplane, speeding over the water near Bay Shore, L. I., struck him when he stood up in a catboat as he prepared to dive to avoid being hit by the flier.

Men Called to Air Service

Provost Marshal General Crowder has issued a call for 624 registrants qualified for limited service for work in the aircraft production bureau, 600 to entrain August 1 for Kelly Field, San Antonio, Texas, and 24 to entrain August 2 for Washington for service at bureau headquarters.

Lieutenant Berssienne, of the French Air Service, now in this country.

C. R. Wilson Co. Holds Banquet

The Bay City plant of the C. R. Wilson Body Co. is manufacturing aeroplanes for the United States Government. On Friday the 12th inst., they gave a banquet to the Government employees of this plant, numbering about fifteen, and to the heads of the departments. The banquet was held at the Colonial Club, Bay City, and was presided over by Mr. J. M. Brown, the manager of the Bay City plant. Captain Patterson in charge of the Production Section, Plane Division, with headquarters in Detroit, and several of his assistants represented the Government at this meeting. Talks were given by Congressman Currie, Congresman for that district, who has recently returned from France, who spoke of the conditions in the war zone and the great need of aeroplanes. Captain Patterson spoke in behalf of the Government, urging carefulness in inspection, and urging above everything—production. Mr. C. Haines Wilson spoke on behalf of the company. Talks were also given by Lieut. Davidson, Mr. Homer Buck and Mr. Champion, Production Manager of the Company.

Marines Extend Air Course

Washington.—Enlisted men in the land and sea service of the Marine Corps are now getting a chance at Marine Corps aviation, the newly added phase of marine activities. The aviation section is being rapidly expanded, it was announced on July 27, and in accordance with the general policy of the Marine Corps, enlisted men get the first chance to qualify as aviators.

Accepted candidates are given a ten weeks' course at the navy ground school, Massachusetts Institute of Technology, Cambridge, Mass., followed by about three months of actual flying training. Ground school students rank as gunnery sergeants and completion of the flying training brings a Lieutenant's commission.

Nungesser Cited for Legion

Paris.—Lieut. Nungesser, the second French ace, was cited for the Legion of Honor on July 29th, having brought down, according to the official announcement, thirty-one German planes and destroyed three observation balloons. He has received many wounds and has been cited fifteen times, and is created an officer of the Legion of Honor for "his superb example of courage."

The AIRCRAFT TRADE REVIEW

N. E. J.

Walnut Needed for Aeroplane Propellers and Gunstocks

The War Department authorizes the following statement from the Bureau of Aircraft Production:

More American walnut is needed for aeroplane propellers and gunstocks. During the four years' test in the present war this wood has proven to be the best material for the manufacture of the above articles.

The Government needs all the walnut that can be secured during the continuance of the war, but it does not buy the wood direct, as not all of it can be used for the above purposes. Mills holding Government contracts for gunstocks or propellers are anxious to purchase walnut trees and logs, and the Government urges the owners of trees or logs to sell them to the sawmills. Owing to their inability to purchase sufficient walnut logs, the sawmill proprietors have not been able to supply the present requirements of this Government and the Allies.

Every Tree Counts

"Fight with your walnut trees," is the new slogan of the Hardwood Section, Bureau of Aircraft Production, and the Small Arms Section, Ordnance Department. Half a dozen trees will provide lumber for a propeller and supply gunstocks for a platoon of infantry. The lack of one plane in the air or a platoon in the front line might lose a battle. Every tree counts.

If you have walnut trees 12 inches or more in diameter, write to Capt. R. L. Oakley, Production Division, Small Arms Section, Ordnance Department, Sixth and B Streets, Washington, D. C. He will advise you where you can sell your walnut at a fair price.

Headquarters Advises How to Correspond

Attention of all squadron and detachment commanders and all concerned is directed to the matter of preparing correspondence and particularly indorsements, going through headquarters to a higher command.

All such correspondence and indorsements must be prepared for the signature of the commanding officer, and the initials of the writer of such correspondence must appear on the papers in the manner prescribed. In many instances indorsements are prepared to pass through headquarters and are signed by the squadron or detachment commander, thus making it necessary to either rewrite the indorsement, or make an additional indorsement for the signature of the commanding officer. This is all unnecessary additional paper work, and the above instructions with regard to preparing indorsements in the proper manner will be strictly adherred to. In the event that indorsements or correspondence reach this office in improper form they will be immediately returned to the point of origin for correction.

In all cases where the correspondence or indorsement is to be forwarded by the commanding officer to a higher authority by indorsement, i. e., the indorsement forwarding papers recommending approval, this indorsement should also be prepared for the signature of the commanding officer by the originator of the correspondence; thus saving additional paper work at this office.

An Old Propeller Company

A most modernly equipped plant for the manufacturer of "Supreme aeroplane propellers has been established by the Stone Propeller Co. in Dayton. This company, one of the oldest propeller manufacturing concerns in the United States, formerly known as the Excelsior Propeller Co., has been established since 1910, and lately removed from St. Louis, Mo. Since locating in Dayton the company has manufactured experimental propellers for the Army through McCook Field.

Hughes Party at Elizabeth

Elizabeth, N. J.—Charles E. Hughes, special investigator for the President into the aircraft industry, accompanied by Attorney General Gregory and his assistant, Mr. Friarson, inspected the plant of the Standard Aircraft Company on July 25, and witnessed a practice flight of the British bombing plane Langley.

Harry B. Mingle, president of the company, conducted the party through the plant.

No statement as to conditions will be forthcoming until the committee reports at Washington.

A New Aircraft Company

The Stratton Engine Laboratories of Buffalo, has just been incorporated for the manufacture of motor cars and aircraft. The corporation is capitalized at $10,000 and has as its incorporators, Messrs. F. G. Hanssel, J. E. Barry, and C. N. Oatman of Buffalo.

An Aircraft Merger

The Curtiss Aeroplane & Motor Corp., of Hammondsport, has just completed a merger with the Curtiss Aeroplane Co.

Marmon Delivers First Liberty Engine

Indianapolis.—The first Liberty engine to be completed by the Nordyke & Marmon Co. ended its 50-hr. trial run, 55 min. after midnight July 13-14, and has been accepted by Government officials, who came from Detroit to inspect it.

Following the long period test, the engine was taken apart and each unit examined separately to determine what wear or strain, if any, was visible after the endurance run. For most of the time the engine was on the block, a normal speed of 1,650 r.p.m. was maintained, and for shorter spaces higher speeds were attained.

The Nordyke & Marmon plant will immediately enter upon quantity production. The company has already built and delivered 1,000 Hall-Scott engines and completion of this order has delayed production of Liberty engines.

Calls Men to Cut Spruce

Washington.—Provost Marshall General Crowder on July 13th issued a call for an additional 3,000 men from 38 states to cut spruce wood in the forests of the Northwest for aeroplane construction.

Dynamometers for Aircraft Testing

Although specifications for the testing of Liberty aviation engines state that these will be made with testing clubs, or testing propellers, word has come from Europe through some of the Allied missions that such a form of test is not to be relied upon too specifically and that some testing apparatus of more specific nature may have to be used.

It is claimed that difference of 50 h.p. are possible with propeller tests when the wind is blowing into the propeller as compared with when it is blowing in an opposite direction. More engine power is naturally required under these conditions. There is also a difference in the power required for driving a propeller when the cutting edge of the club becomes frayed as it frequently does. Once frayed, the edge must be sandpapered down and revarnished which reduces its size and again upsets calcualtions.

Fitting electric dynamometers for testing all of the engines will prove expensive, but undoubtedly some form of compromise will have to be arrived at if reports from European Allies are borne out by practice in America. It is known that some of the European makers use the water-brake test. This suggests the possibility of using the water-brake test for general work and for perhaps 90 per cent of the testing when using the elctric dynamometer for the final test to be sure rated horsepower is obtained.

Installed Dynamometer Equipment

The Duesenburg Motor Company have recently completed a very fine gasoline engine test house in the country. It has been constructed primarily for the testing of aeroplane engines.

They have complete dynamometer equipment for the testing of motors ranging from 300 to 900 horsepower and, as after calibrating their own aeroplane motor testing propellers they will not be using their dynamometer equipment continuously, they will be glad to run dynamometer tests for others on a basis as follows:

For the use of 1—300 H.P. machine $85.00 per day during tests. This to include one man to handle dynamometer and testing apparatus. There wil be an extra charge for oil and fuel used. Another helper will be furnished at the rate of $7.00 per day.

For the use of 2—300 H.P. dynamometers the charge will be $125.00 per day.

For the use of 3—300 H.P. dynamometers the charge will be $160.00 per day.

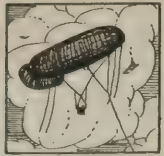
There will be a charge of $25.00 per day for one dynamometer, $40.00 per day for two dynamometers and $50.00 per day for three dynamometers during the time that the motors are being set up and the dynamometers cannot be used for other purposes.

The above charge includes the use of tachometers and other instruments used in the testing.

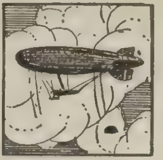
They prefer to have customers furnish all fittings complete, ready to hook up to the dynamometers, and would prefer that this work be done outside. If, however, it is possible and convenient to help customers make up some of these extra parts, time and material will be charged for at reasonable rates.

They will furnish customers with complete record and data of tests after completion of run.

A view on the interior of one of the departments of the factory of the Springfield Aircraft Co.



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

THE organization of the Balloon Service differs in detail in the British, French and American armies. Broadly, however, their organization is the same. Whether the British adopted the French system or the French the British, or whether their present system is a combination of the best points in both, I can not say. The American system was somewhat different from either up till recently, when the Signal Corps decided that they would fall in with the standard practice of the Allies in France. In America, the tactical unit, that is one balloon and its complement, is known, or was known, as the Company. In the Royal Air Force, the tactical unit was a Section.

Each section handled one balloon of the Cacquot type, and was commanded by either a Captain or a First Lieutenant. Two sections, one commanded by a Lieutenant and the other by a Captain, comprised a Balloon Company. The senior company commander was a major and the other commanders were captains. A Balloon Wing is commanded by a lieutenant-colonel, who has as his second in command the senior company commander, a major. The balloon wing comprises all the balloon companies acting on an army front. Theoretically, therefore, with five British armies in France, as at the present time, there should be five balloon wings. However, it does not always work out that way. Sometimes there are what are known as Auxiliary Wings.

On a peacetime basis the above statement holds almost altogether, but on the Western Front today so many things enter into the scheme of things that at best the peacetime establishment is somewhat inadequate. The special conditions obtaining in the present war necessitate considerable change, so that it is quite possible to see three or four sections working together as a company and five, six or maybe seven companies working in one wing, where according to peacetime practice there should only be at the most four.

The senior section commander, the captain, is the second in command of the company.

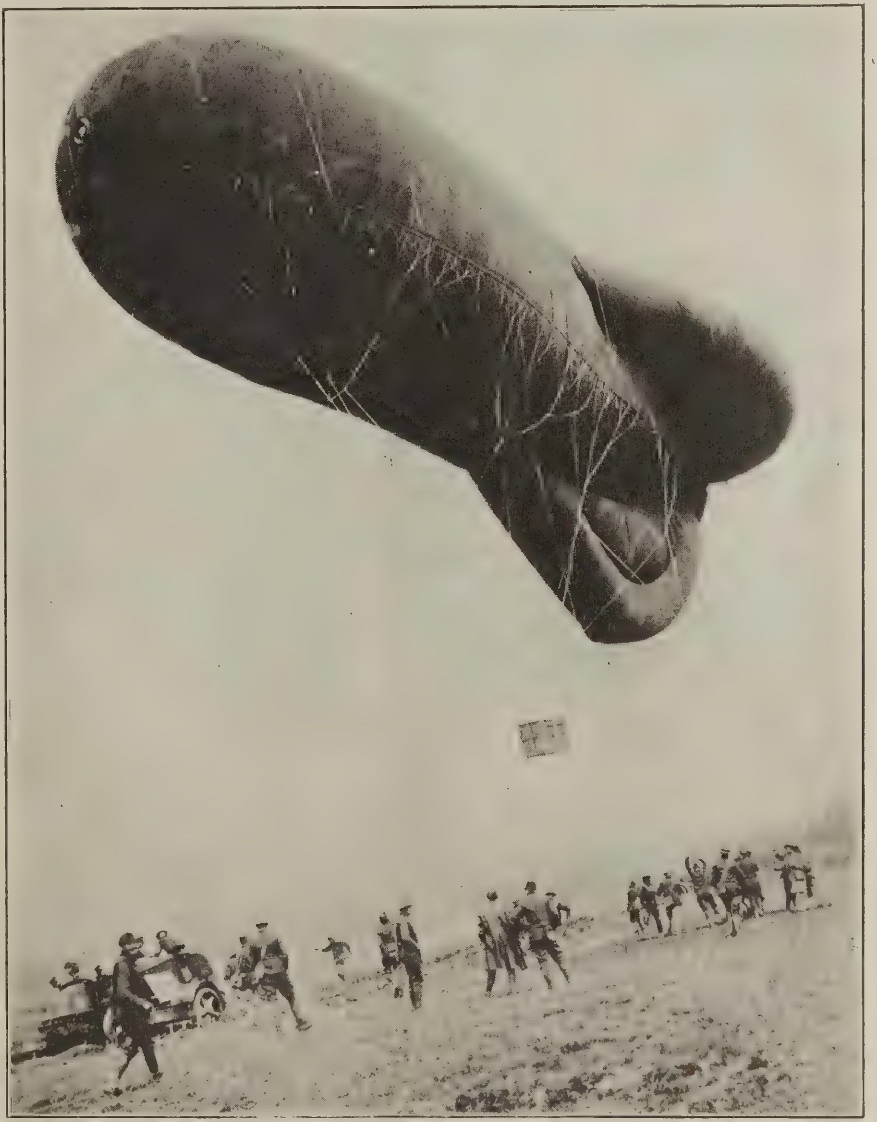
Each section has, at the present time, as flying officers, besides the section commander, who takes flying duty with the rest of his officers, three second lieutenants. To be quite Irish about it, some of these second lieutenants may be first lieutenants, but as a matter of establishment they are supposed to be second lieutenants. They are graded as flying officers for purposes of pay.

Likewise, from the exigencies of service, there may be only two or even one officer in the section beside the commander. There may be a section lucky enough to have four or five, though they are very few. I have even heard of one balloon in France which had for about three weeks six flying officers beside the section commander. That section must have had a glorious time.

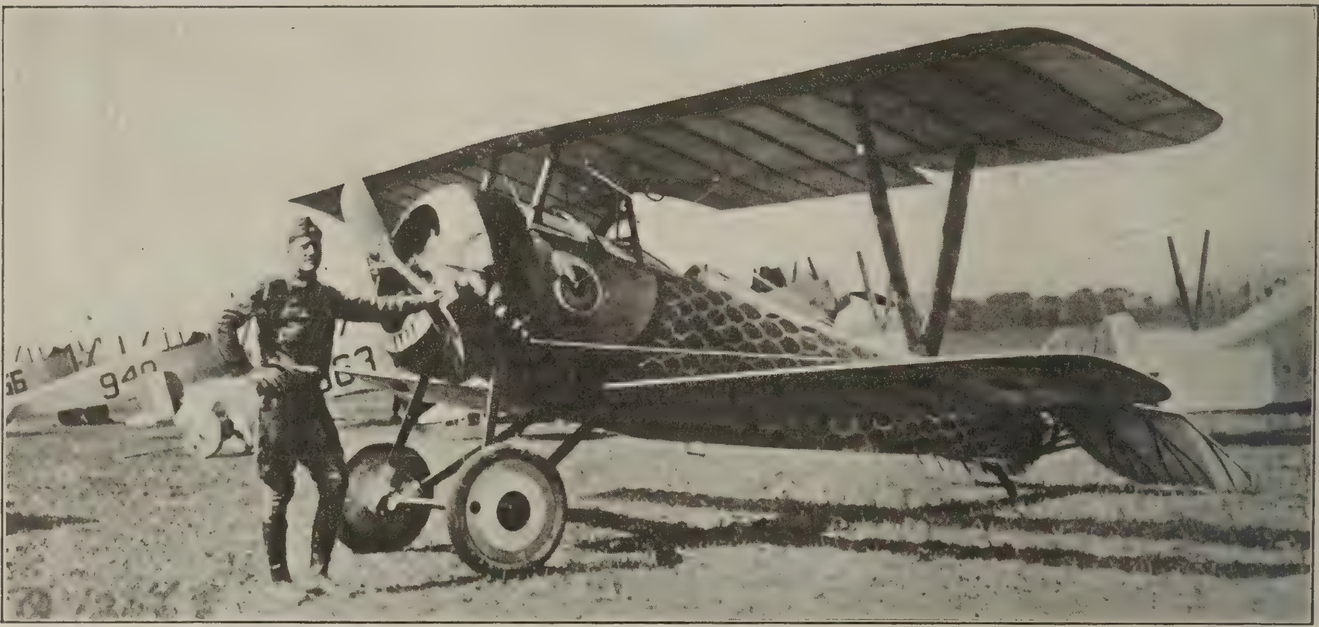
Each section has in enlisted personnel about ninety non-commissioned officers and men. The senior N.C.O. is the Flight Sergeant, who corresponds to a Company Sergeant-Major, or Company Color sergeant. There is a Rigger Sergeant and a Telephone Sergeant, a complement of corporals, riggers, telephonists and wireless men and balloon hands. There are a certain number of transport men and headquarter staff who are for the most part attached to Headquarters. These consist of truck and tender drivers, motorcyclists, and mobile machineshop men. The headquarters staff men are mostly clerks and telephonists. Each section sends some men to Company Headquarters and each Company sends some to Wing Headquarters. Brigade Headquarters is the one link between the Wings and the Headquarters of the Flying Force in the Field. It is at Brigade where the aeroplanes and the balloons come together. Theoretically, one Balloon Wing and three or four Aeroplane Wings constitute a Brigade of the Royal Air Force.

"Flivver" Aircraft in England After the War

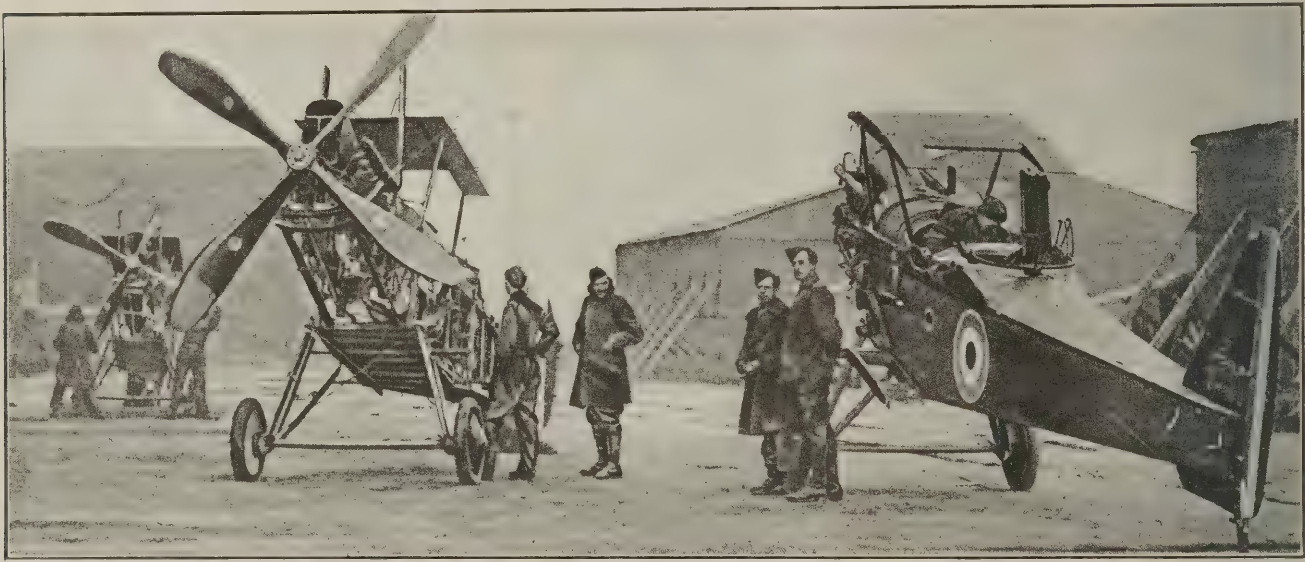
London.—An English aeroplane factory proposes after the war to manufacture a standardized aeroplane for popular use, which it expects to be able to put on the market at a uniform price of $500.



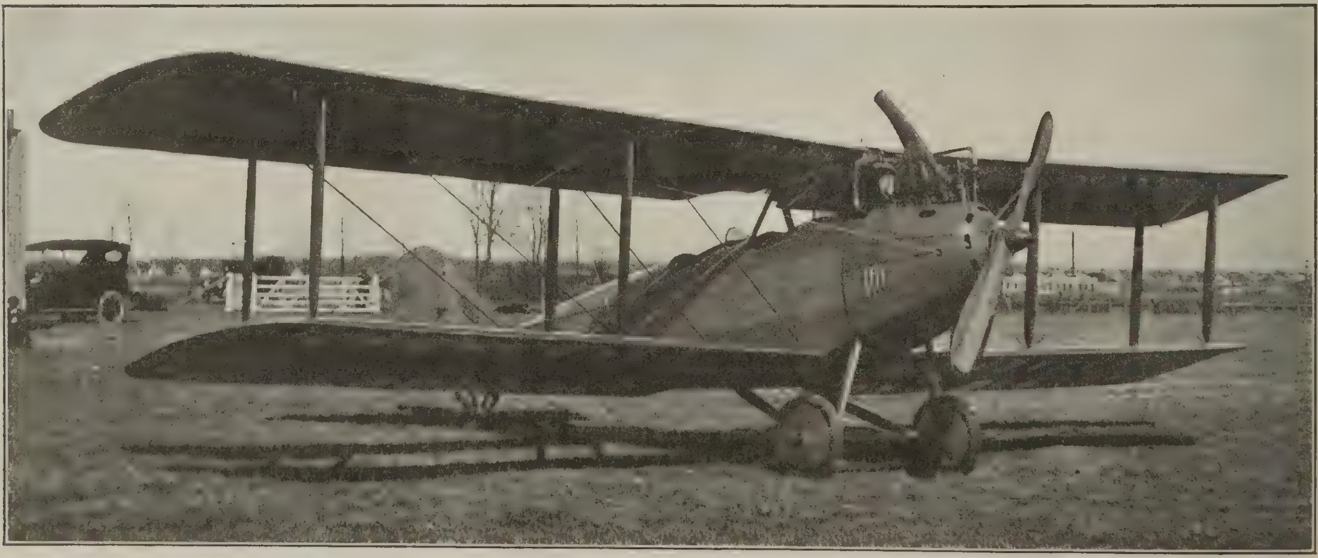
A Cacquot type observation balloon in use on the western front. Owing to the low visibility, which is shown by the faintness of the background, this balloon has been put up in "ballast". The basket in which the observer stands hanging below the balloon has been stripped of all its instruments. The parachutes which usually hang over the edge of the basket in their cases have been detached. This balloon is ascending in a wind of about 30 miles. The cable, which is seen in the photograph, is fastened to the winch shown in the left foreground. The winch is mounted on a motor truck and is thereby rendered quite mobile. The valve can be seen in the immediate nose of the balloon. (Committee on Public Information)



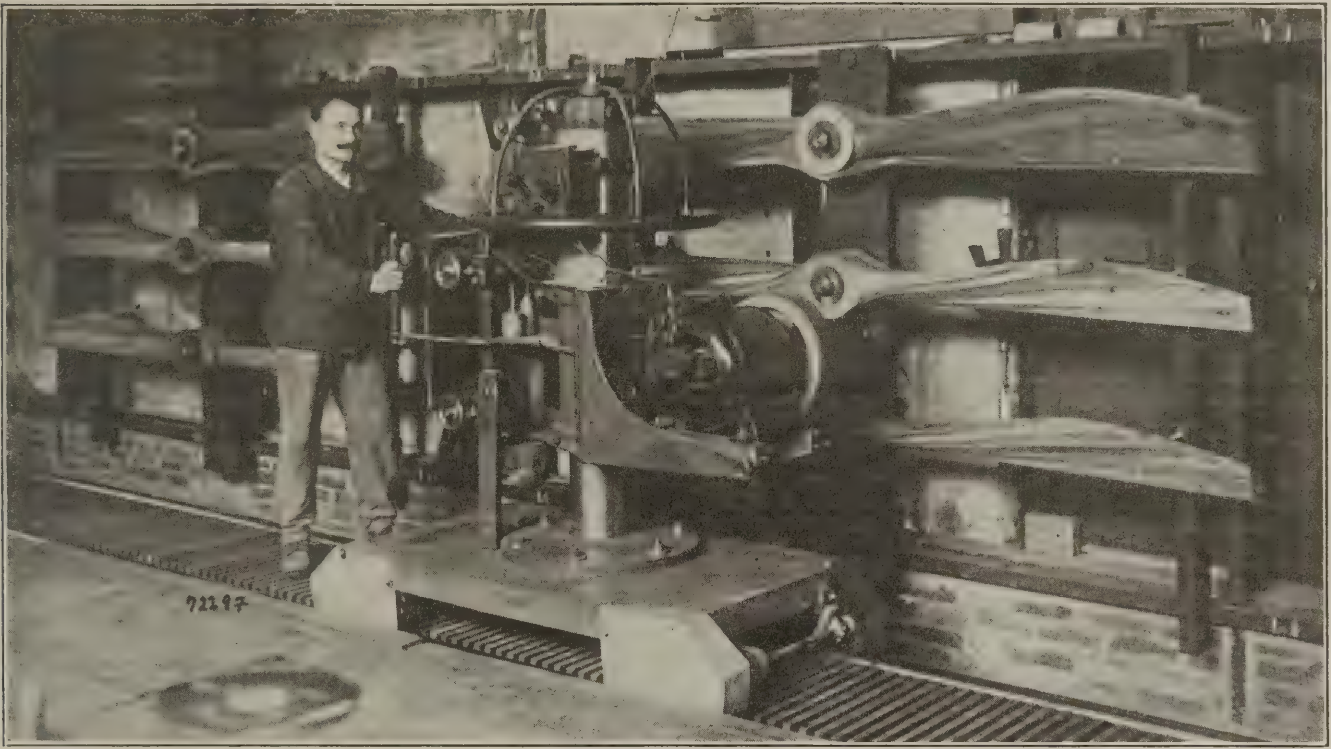
A very fast scout aeroplane flown by American airmen in France. It measures only 15 meters from tip to tip, and is driven by a 160 horse power Gnome motor and a French propeller. (Photo Committee on Public Information.)



A British four-bladed propeller on a British artillery spotting and night flying machine



The Lawson M. T. 2 tractor biplane equipped with Hall Scott motor and an American-made propeller



An electrically and manually operated automatic machine travels slowly along the rough laminations, shaping three, and sometimes five or six, blocks all at one operation. This modern tool is a development of the old and well-known carving machine

HALF A MILLION PROPELLERS A YEAR

By HENRY WOODHOUSE

Author of Textbook of Military Aeronautics and Textbook of Naval Aeronautics, etc.

HALF a million propeller blades a year is probably what the United States will have to produce.

Opinions differ somewhat as to what constitutes the size of an aircraft program large enough to meet the conditions which the Allies may have to meet in 1919-1920, but there is a general opinion that whereas aerial warfare is extending and becoming more intensive day by day, the least that can be done by the United States is to prepare to place 5,000 aviators at the front as soon as possible and maintain that number in fighting order thereafter.

The testimonies of Allied officers before the Senate Committee on Military Affairs brought out the fact that forty per cent of the aviators at the front must be replaced each month. An average of about fifteen per cent are killed; the rest must be replaced for various reasons, including shocks to the nervous system, wounds, etc. This means that to keep 5,000 aviators at the front we must undertake to supply 2,000 each month thereafter, or 24,000 in one year. To give complete training to these aviators in this country will take an average of from five to ten propellers for each aviator, because the propeller is the one thing that is broken very often during the training period.

Official reports vary regarding the percentage of aeroplanes that must be replaced each month. The figures given average from sixty per cent to one hundred per cent.

The actual losses are greater in some branches of the Air Service than the other, and have been increasing greatly, the greater increase having taken place in the past ten months, due to the more intense methods of warfare, greater efficiency in anti-aircraft gunnery and barrage fire, application of aeroplanes for contact patrol, cooperating with infantry and in attacking troops from low altitudes. Also from more intensive aerial warfare and bombing during day and night.

Whether in the future the proportions in losses and wastage will be greater or less than they are at present cannot be anticipated. To be safe it is necessary to anticipate that they will be greater or at least as they are at present, and that means that we must supply 5,000 aeroplanes a month to keep 5,000 aviators at the fronts. Some of the aeroplanes, about 20/100, are and will be single motored; about 30/100 will be double motored; the other 50/100 will have three and four motors—as the proportion of large machines is increasing greatly.

Twenty-five propeller manufacturers are now manufacturing 400 propellers a day, according to a statement issued by the War Department, which reads in part:

Twenty-five experienced American manufacturers are now producing a total of 350 to 400 highest quality aeroplane propellers per day for the air service. Ample stock of propeller timber is already purchased or available and the present supply of propellers in this country is more than equal to the demand.

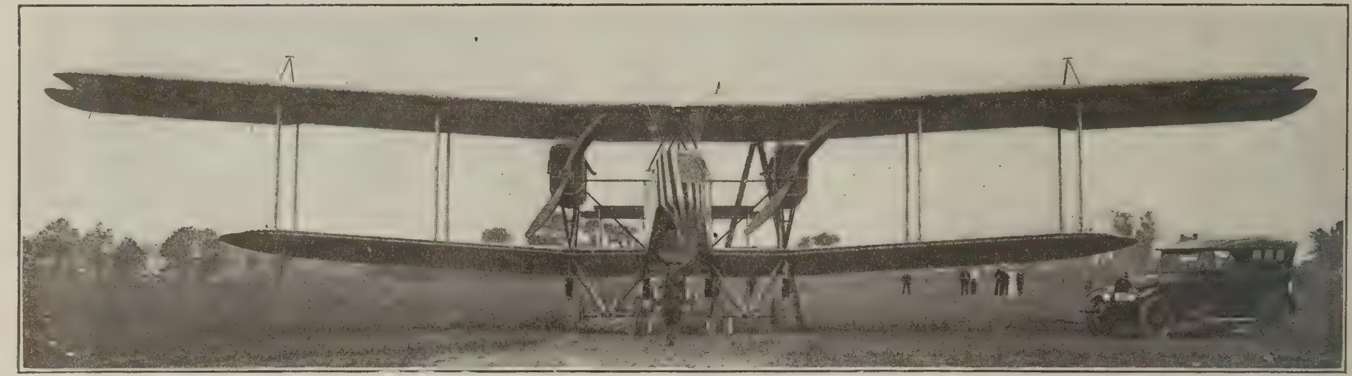
After the declaration of war the Signal Corps was forced to build up the existing propeller industry and encourage the manufacture of propellers as a new enterprise.

In April, 1917, there were only four aeroplane companies making their own propellers. Since that time a great development has taken place, especially since December, 1917. The older companies have expanded and new concerns have sprung up, chiefly to the increased demand for propellers and the requests of the Signal Corps.

How They Are Made

American double-bladed aeroplane propellers are built up from boards about 1 inch in thickness, cut out to the rough shape of the laminations. These boards or laminations are cut out from carefully selected lumber which has previously been kiln-dried to a uniform moisture content of from 6 to 8 per cent, great care being taken to avoid case-hardening and too rapid drying, which may diminish the strength of the lumber. The laminations when cut for use in the propeller must be clear pieces, free of all defects, and with straight grain running along the length of the piece. After cutting to shape, the boards are balanced individually and selected according to this balance and grouping together for the complete propeller.

Following this selection, the completed groups of laminations are assembled and placed in a hot box to prepare for gluing. With correct temperatures of material and room gluing is done as rapidly as possible and the glued-up blocks left in presses or clamps to set for 24 hours. The blocks are then cut down by carving machines, lathes, shapers, etc., to within about one-fourth inch of the final finished size and shape, and in this state are hung for two weeks in a conditioning room before being worked to the final finish.



A front view of the "Langley," the new Handley Page Air Cruiser launched by the Standard Aircraft Corporation of Elizabeth, N. J., on July 8, 1918. It is equipped with two bladed propellers

Careful Finishing Work

The final finish is done on the bench and completes the propeller to the point of being ready for varnish or covering. The bench work is done with great accuracy so as to conform exactly to the desired pitch and shape and to have the two blades in exact alignment and track. The propeller, acting as a flywheel for the aero motor, must be perfectly balanced. When the propeller is finished in the "white" it is ready for inspection of glue joints, dimensions, and balance, after which it is finished with five coats of spar varnish and rebalanced.

Existing opinion is somewhat divided as to the best wood for propeller purposes, but the past practice of French and English Governments greatly favors walnut and mahogany for combat blades, the former being considered better. Other woods have been used for training-type propellers, principally quarter-sawed white oak, birch, cherry and poplar.

It is believed that quarter-sawed white oak will come to be used more generally on account of its greater strength and the necessity for getting maximum strength in the propellers used on the newer high-powered, high-speed engines.

The four-bladed propeller is generally used instead of the three, because of its simpler and stronger construction features. The two-bladed propeller is more efficient than the three or four, and would always be used if the arrangement of planes and engine permitted.

Four-bladed Propeller Best Throttled Down

Four-bladed propellers are more efficient than two-bladed when the motor is running throttled down, at low speed.

The three-bladed propeller has been tried repeatedly and has proven satisfactory in some cases. But the construction does not permit continuity, each blade being a separate piece, and so far three-bladed propellers have not been able to stand the high horsepower motors.

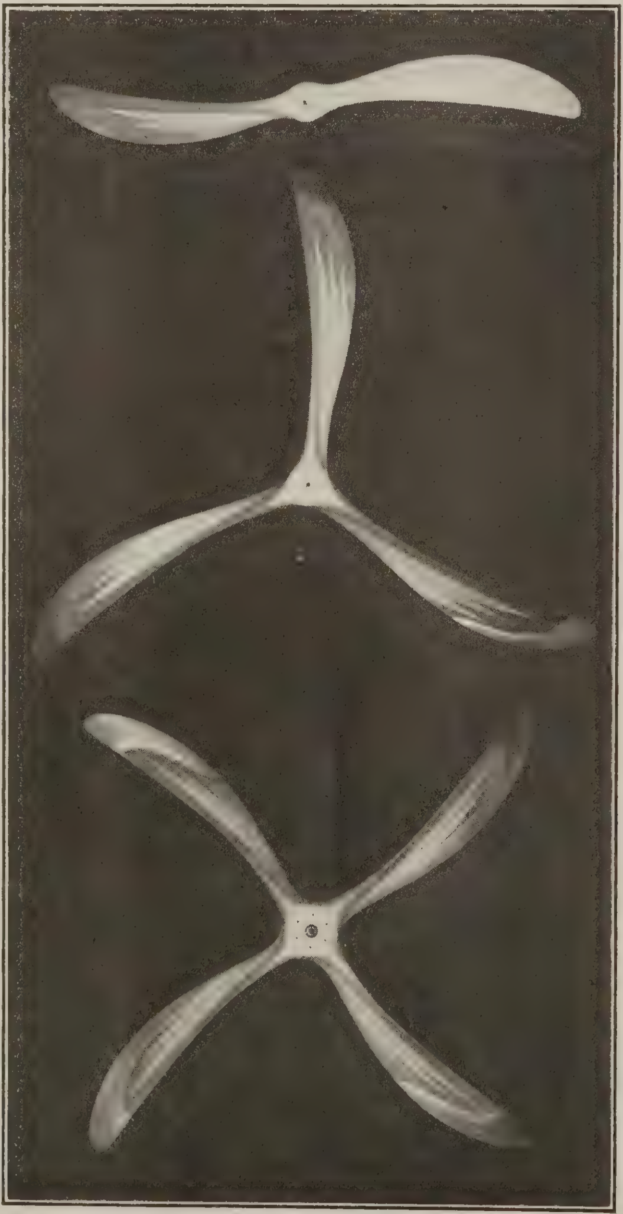
Propeller Field Unlimited

The subject of propellers is a huge subject, with a practically virgin and unlimited field for experimentation and improvement.

So many factors, some yet undefined, must be considered in the design and application of propellers, and the field is so exclusive and requires such extensive equipment and machinery for testing and experiments, that so far no individual organization has found it possible to do more than to analyze existing propellers and test them in the laboratory. The actual work of research still remains to be done—and it should be done without delay.

This research work is too costly and expensive to be done by individuals or by manufacturers. It should be done by a Government agency, or by a well endowed institution.

The pioneers in this work, the Wrights, Curtiss, Eiffel, Riach, Heath, George de Bothezat, Zahm, Ohmstead, Martin, and their recent followers went into the subject to the fullest extent of their means and time. They have accomplished much in increasing the efficiency of existing propellers, but there is a lot more to be done and it is experimental research work, which requires large organizations and extensive equipment.



Models of the Two-bladed, Three-bladed, and Four-bladed Paragon Propellers

Wright Brothers Had to Do Pioneer Work to Get Propellers for Their 1902-3 Flyer

The Wright brothers had to do pioneer work to get propellers for their 1902-1903 flyer, just as they had to do in other lines. Orville Wright has defined the exact status of the propeller situation at the time as follows:

"Our tables of air pressures and our experience in flying with the 1902 glider, enabled us, we thought, to calculate exactly the thrust necessary to sustain the machine in flight. But to design a propeller that would give this thrust with the power we had at our command, was a matter we had not as yet seriously considered. No data on air propellers was available, but we had always understood that it was not a difficult matter to secure an efficiency of fifty per cent with marine propellers. All that would be necessary would be to learn the theory of the operation of marine propellers from books on marine engineering, and then substitute air pressures for water pressures. Accordingly we secured several such books from the Dayton Public Library. Much to our surprise, all the formulæ on propellers contained in these books were of an empirical nature. There was no way of adapting them to calculations of aerial propellers.

(To be continued)

PREDICTING STRENGTH AND EFFICIENCY OF AEROPLANE PROPELLERS

Charts and Formulae for Calculating Horsepower Absorbed and Torque Delivered at Given Engine and Plane Speeds

By F. W. CALDWELL*

UNDER war conditions, when there is lack of time for extensive propeller trials and experimental work, we must be able to predict the performance of a propeller as to the horsepower absorbed at given airplane and engine speeds and as to its efficiency under these conditions. It is also necessary to make stress calculations for the purpose of predicting strength, since there is usually no opportunity for a destructive test before the propeller has to be put into production. The main purpose of this paper is to show how such calculations are made.

The first step is to choose a diameter. The chart, Fig. 1, shows the minimum diameter required to maintain the slip as low as 15 per cent. The chart also shows the maximum propeller speed that can be used for any given diameter and horsepower. If the speed is greater than that shown as the maximum, a smaller diameter must be chosen for the propeller, and there is a consequent loss in efficiency.

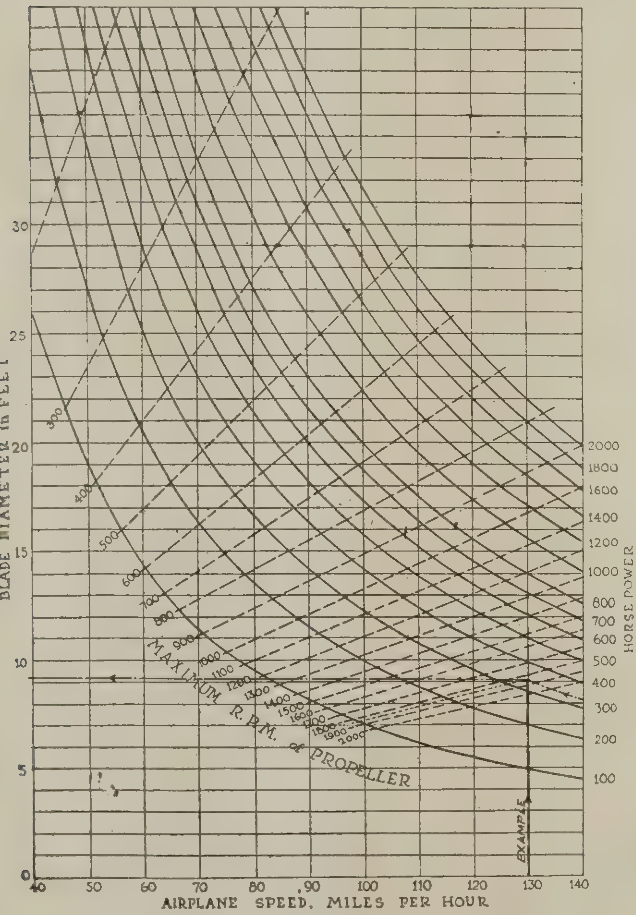


Fig. 1—Chart for determining propeller diameter for 15 per cent slip, and also maximum propeller speeds for given diameters and horsepowers

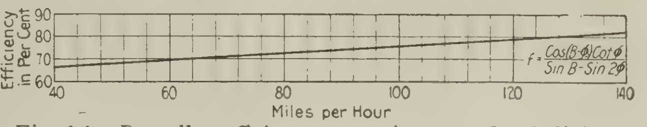


Fig. 1A—Propeller efficiency at various speeds of flight

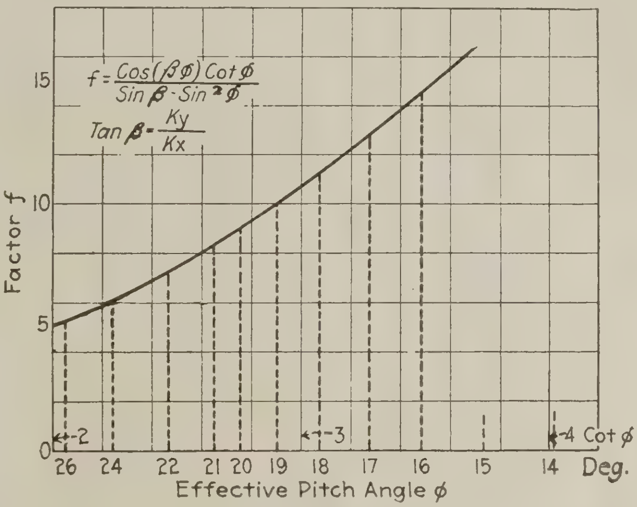


Fig. 1B—Values of factor f for various effective propeller pitch angles

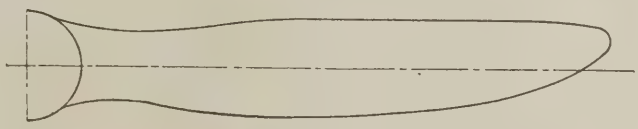


Fig. 2—Experimental blade form

The diameters given are minimum diameters for good practice. In general the diameter should be made as large as possible without making the blades so narrow that they will flutter excessively when wood construction is used. Plane designers should bear in mind the necessity of ample propeller diameter in laying out a power plant installation; an otherwise excellent design may be spoiled by limitations of clearance, resulting in too small a propeller diameter.

After determining the diameter, a blade form must be chosen. The question of the outline of the blade form is an unsettled one, since different blade forms are based on elaborate theories. The difference in efficiency of different blade forms is not great, but the difference in strength is considerable. The form shown in Fig. 2 is a fair one, both as to efficiency and strength.

The following nomenclature relating to propeller design will be used in this paper:

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*Aeronautical mechanical engineer, Aviation Section, Signal Corps, U. S. Army

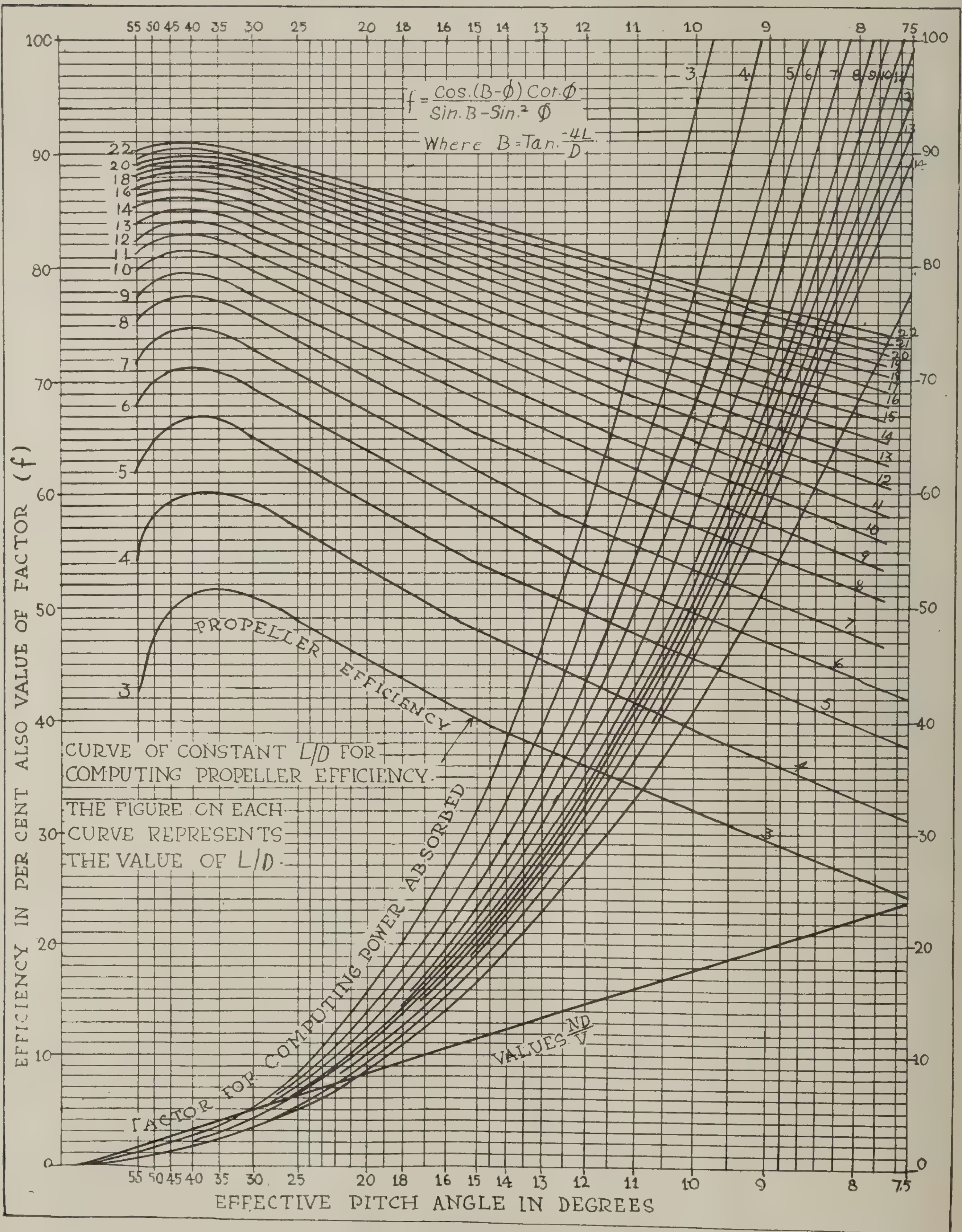

f = Cos.(B-Φ) Cot.Φ / Sin.B - Sin.² Φ
Where B = Tan.-4L/D
CURVE OF CONSTANT L/D FOR COMPUTING PROPELLER EFFICIENCY.
THE FIGURE ON EACH CURVE REPRESENTS THE VALUE OF L/D.
PROPELLER EFFICIENCY
FACTOR FOR COMPUTING POWER ABSORBED
VALUES ND/V
EFFICIENCY IN PER CENT ALSO VALUE OF FACTOR (f)
EFFECTIVE PITCH ANGLE IN DEGREES
55 50 45 40 35 30 25 20 18 16 15 14 13 12 11 10 9 8 7.5
0 10 20 30 40 50 60 70 80 90 100
3 4 5 6 7 8 9 10 11 12 13 14 16 18 20 22
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Fig. 3

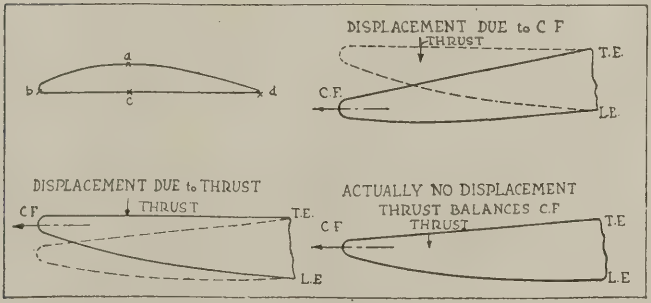
ρ = specific weight of air expressed in pounds per cubic foot.
g = acceleration due to gravity = 32.2 f.p.s.
K_y = lift coefficient, absolute units.
K_x = drag (or lift) coefficient, absolute units.
L = vertical component of force (lift) on aerofoil, pounds.
D = horizontal component of force (drag) on aerofoil, pounds.
f = factor for computing work absorbed by propeller.
C = empirical constant depending on blade form.
S = area of plane surface, square feet.
V = velocity of airplane, feet per second.
P_e = effective pitch of propeller or advance per turn.
V_1 = velocity (in helical path) of propeller element, feet per second.
v = velocity of slip-stream, feet per second.
b = maximum blade width, feet.
b_1 = effective blade width, feet = $0.75b$ for blade form in Fig. 2.
N = engine speed at ground level, rev. per second.
N_1 = engine speed at 20,000 ft. altitude, rev. per second.
D = diameter of propeller, feet
D_1 = equivalent diameter of propeller, feet = $0.580D$ (for computing work absorbed only).
R = radius of propeller, feet.
T = thrust, pounds.
A = area of propeller disk, square feet.
A_1 = effective area of propeller disk, square feet $\left(= 0.95\pi \frac{D^2}{4}\right)$ (as corrected for the 5 per cent area considered ineffective due to the radiator).
$\phi = \tan^{-1} \frac{V}{\pi ND}$ (effective pitch angle).
$\beta = \tan^{-1} \frac{K_y}{K_x}$
θ = blade angle, degrees.
e_1 = theoretical efficiency (Froude Method), per cent $\left(= \frac{100V}{V + v/2}\right)$
e_2 = aerofoil efficiency, per cent.
e = true efficiency, per cent $(= e_1 \times e_2)$.

It is necessary to solve for blade width and angle of attack by means of an empirical formula. As a rough rule the angle of attack may be taken as 2 deg. for plane speeds above 100 m.p.h. and 3 deg. for plane speeds below 100 m.p.h. The method of checking this would go beyond the scope of this paper, which is intended to cover only fundamentals.

The maximum blade width should be about one-twelfth the diameter for the best practice. This gives an "aspect ratio" of six for each blade.

The usual method of computing blade widths consists in dividing the blade into zones and treating each zone as a separate aerofoil. The power absorbed by each zone is then found from the formula

$$\text{Work for zone} = \frac{\rho}{g} K_x S V_1^3. \qquad (2)$$



Figs. 4, 5 and 6—Deflections caused by axial thrust and centrifugal force, as well as cross-sectional view of blade

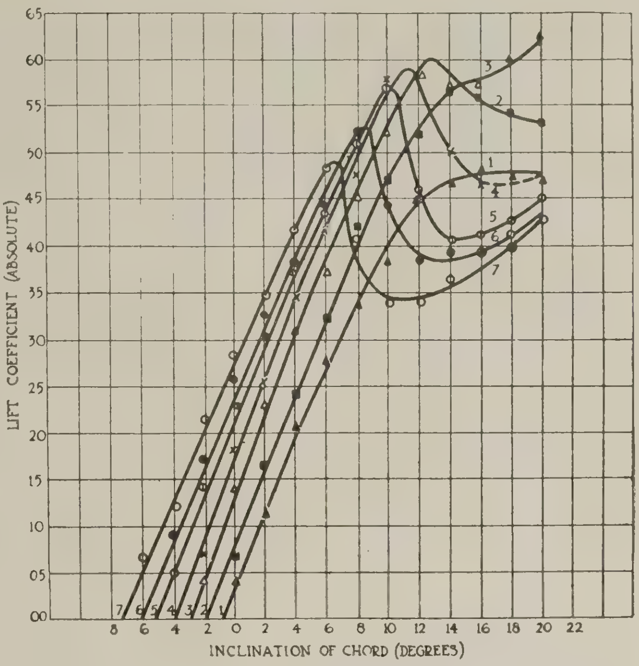


Fig. 7—Characteristics of typical areofoils from the 1912 report of the National Physical Laboratory, England

This may be simplified by taking an average value of K_y for the blade and a weighted mean for the blade width. The power absorbed per blade is then found from the formula:

$$\text{Power} = \frac{\rho}{g} K_y b_1 R V^3 f C \text{ ft.-lb. per sec.} \qquad (3)$$

The value of f may be obtained by taking 0.58 of the diameter to represent an equivalent diameter for the whole blade. (This value has been established experimentally for blade form shown in Fig. 2.) Then the value of $V/0.58\pi ND$ is calculated, as is the corresponding angle whose tangent is $v/0.58\pi ND$, and the corresponding value of f is found on the chart, Fig. 3.

The ordinate corresponding to the angle is followed until it crosses the line corresponding to an L/D of the section, and the corresponding value of f is read on the scale at the right or left. An average value of L/D may be assumed with sufficient precision to be twenty, when using this method.

The empirical constant C is dependent on the blade form and must be determined experimentally. For the blade form shown in Fig. 2 it is 1.1, while it varies from 0.85 to 1.2 for different blade forms now in use. The symbol b_1 represents the weighted mean of the blade width. This weighted mean of the blade width is found by determining the mean ordinate of a curve in which the cubes of the radii of the blade sections are laid off as absissa and the corresponding blade widths are laid off as ordinates. This empirical method gives good results.

The best method of computing propeller efficiency consists in an extension of the water-propeller theories. The theoretical efficiency $V/(V + v/2)$ is computed. First the thrust is computed and then the slip-stream velocity from the impact formula $T = \frac{\rho}{g} AVv$.

To compute the aerofoil efficiency a representative point along the blade is taken. This will usually be at 75 or 80 per cent of the radius according to the blade shape; for the blade shown in Fig. 2 it is at about 78 per cent. The product of the theoretical and aerofoil efficiencies gives the actual efficiency very closely. There is a further small correction due to the spiral component of the slip stream.

The angle whose tangent is $V/0.78\pi ND$ is found and a corresponding ordinate ϕ, Fig. 3, is followed until it crosses the efficiency line corresponding to the L/D of the aerofoil section at 0.78 of the radius. This L/D will be about twenty in good design.

Wood has been the favorite propeller material up to the

The polishing of the propeller is one of the last phases of the work. This is not a difficult piece of work, and the layman might think it an unnecessary waste of time, when the war is demanding high speed production. But propeller efficiency means climbing efficiency and speed efficiency, and that in turn spells safety for the life of the pilot trying to outmanoeuvre his adversary in battle. Skin friction is a real factor in the power consumption of a propeller blade cutting through the air at a high peripheral speed. A high polish cuts this skin friction down and lessens too the wearing effect of the self-induced blast of air upon the surface.

Metal tipping, here shown in process, is one of the most difficult and specialized phases of propeller manufacture. The skilled labor for this painstaking work is scarce, and the training and breaking in of new workers is very slow. The copper, which is the material usually used on propellers for Naval seaplanes, must be curved both longitudinally and latitudinally, and no mechanical method has been devised which will make this metal lie smoothly over a convex surface. The necessity for this tipping is more apparent on water machines than land planes, as the spray from the water very rapidly frays the thin edges of an untipped propeller, so great is the peripheral speed of the outer ends of the blades.

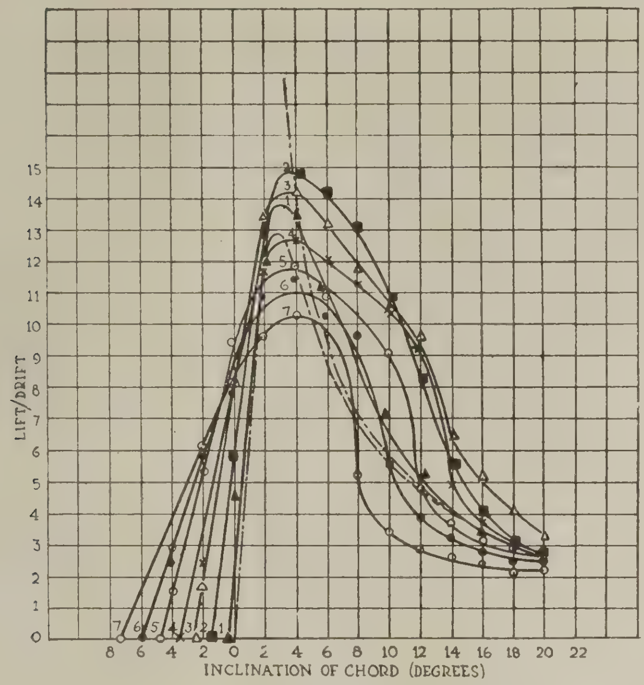


Fig. 8

present. Its success is mainly due to its high tensile strength, light weight and flexibility. Flexibility is an important factor in reducing propeller stresses, as can be seen from Figs. 4 to 6. When the thrust is applied to a wooden propeller, the blade bends and the centrifugal force creates a moment tending to restore it to its original position.

The lack of flexibility is evidently one of the weaknesses of steel propellers, since the metal cannot bend and accommodate itself to the different flying attitudes. This difficulty can be overcome for any single flying attitude and air density by offsetting centers of gravity of different sections in such a way that the bending moment due to air pressure is compensated for by the bending moment due to centrifugal force.

Among the propeller materials experimented with up to date the metals have shown the least encouraging results. While I do not consider a steel propeller out of the question, it is certain that the results to date have been discouraging. Steel propellers should be given a thorough ground test before being used in flight on an airplane, since the failures are usually extremely sudden and are disastrous to the plane structure.

Aerofoils

The aerofoil sections used have an important bearing on the propeller efficiency. The characteristics shown in Figs. 7-9 are taken from a report issued in 1912 by the National Physical Laboratory of England, and are about as good as any that have been published.

Adjustable-Pitch Propellers

Almost from the start of air-propeller work, a propeller with adjustable pitch has been considered highly desirable, because it is believed that the efficiency of the propeller could then be maintained constant for different airplane speeds. This is based on the theory that the L/D of the aerofoil section is the controlling factor in the propeller efficiency, a theory which is not borne out in practice.

Fig. 10 illustrates the effect of varying plane speed on the apparent angle of attack of a propeller section. This angle is usually chosen as 2 deg. for a flight speed of 130 m.p.h. and the aerofoil will then have a ratio of K_y/K_x of about twenty. In climbing at the rate of 70 m.p.h. the apparent angle of attack will be increased to about 10 deg., and the K_y/K_x ratio will drop to from ten to twelve.

Fig. 11 shows that the increase in true angle of attack is not so great when the slip stream velocity is taken into account; besides this, the theoretical efficiency $(V/V + v/2)$ is greatly reduced in climbing and is not increased by an increase in the aerofoil efficiency.

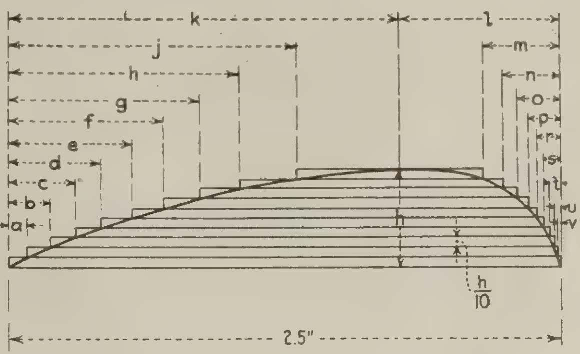


FIG. 9—DIMENSIONS OF TYPICAL AEROFOIL SECTIONS
(FROM N. P. L. REPORT)
All dimensions in inches

$a = 0.085$
$b = 0.190$
$c = 0.305$
$d = 0.430$
$e = 0.570$
$f = 0.715$
$g = 0.875$
$h = 1.060$
$j = 1.315$
$k = 1.770$
$l = 0.730$
$m = 0.350$
$n = 0.255$
$o = 0.190$
$p = 0.140$
$r = 0.100$
$s = 0.070$
$t = 0.045$
$u = 0.025$
$v = 0.010$

Plane No.	h
1	0.063
2	0.125
3	0.187
4	0,250
5	0 312
6	0.375
7	0.437

An analysis of an adjustable pitch propeller (appended to this paper) shows no gain in efficiency. There is, however, a net gain in horsepower delivered to the plane, owing to the increase of engine speed in climbing. For the case in question the gain in the rate of climb is 49 per cent. Fig. 12 shows the gain in the rate of climb in a somewhat slower machine.

The keeping up of the engine speed becomes of interest in connection with the development of an engine with torque that is constant at high and low altitudes. From the performance curves shown in Fig. 14 it is apparent the climbing rate of a plane equipped with such an engine would be greatly improved if the engine speed near the ground were increased and kept the same as the plane climbs.

Constant Engine Power at Altitudes

It is the opinion of the author that, if it becomes desirable, an adjustable pitch propeller of fairly light weight can be built for a smooth running engine, such as the Liberty twelve, but considerable trouble may be expected with engines that have an inherent vibration.

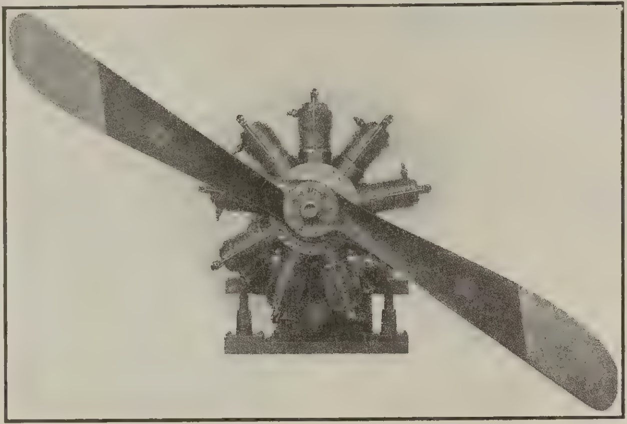
The author has been told by many engine designers that it would be useless to build an engine to maintain its power at altitudes, because the propeller efficiency would then be so low that the net gain would be small.

All aeronautical engineers who have made a study of the subject realize that the development of an engine with constant, or nearly constant torque at altitudes up to 20,000 or 30,000 ft., is the one outstanding opportunity for improvement in airplane performance. It is just as easy to design propellers for operation at 20,000 ft. as it is to design them for performance at the ground level, so that the problem is one that must be solved by the engine designers.

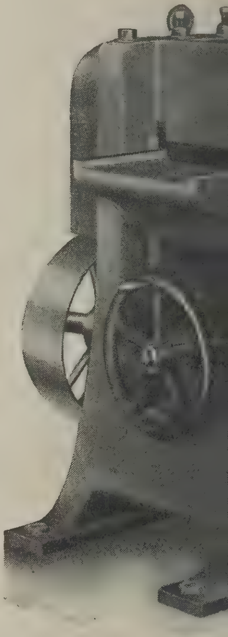
The air density at 20,000 ft. is of the order of 50 per cent of that at ground level. The density of air is about 0.13 per cent of the density of water. Yet we are using the same means of propulsion in airplanes as is used in boats, and we are obtaining in practice efficiencies as high as 85 per cent, something which cannot be approached in marine practice. Not only is this true, but a propeller designed for use at 20,000 ft. will function without appreciable loss of efficiency near the ground, as may be seen fom an analysis in which airplane and propeller performance are worked out in a typical case.

The words "constant torque" as used in the following analysis mean that the torque is independent of both the engine speed and the altitude. This is the simplest case to discuss, and the discussion applies exactly to this case alone An engine that satisfies this requirement only in part would

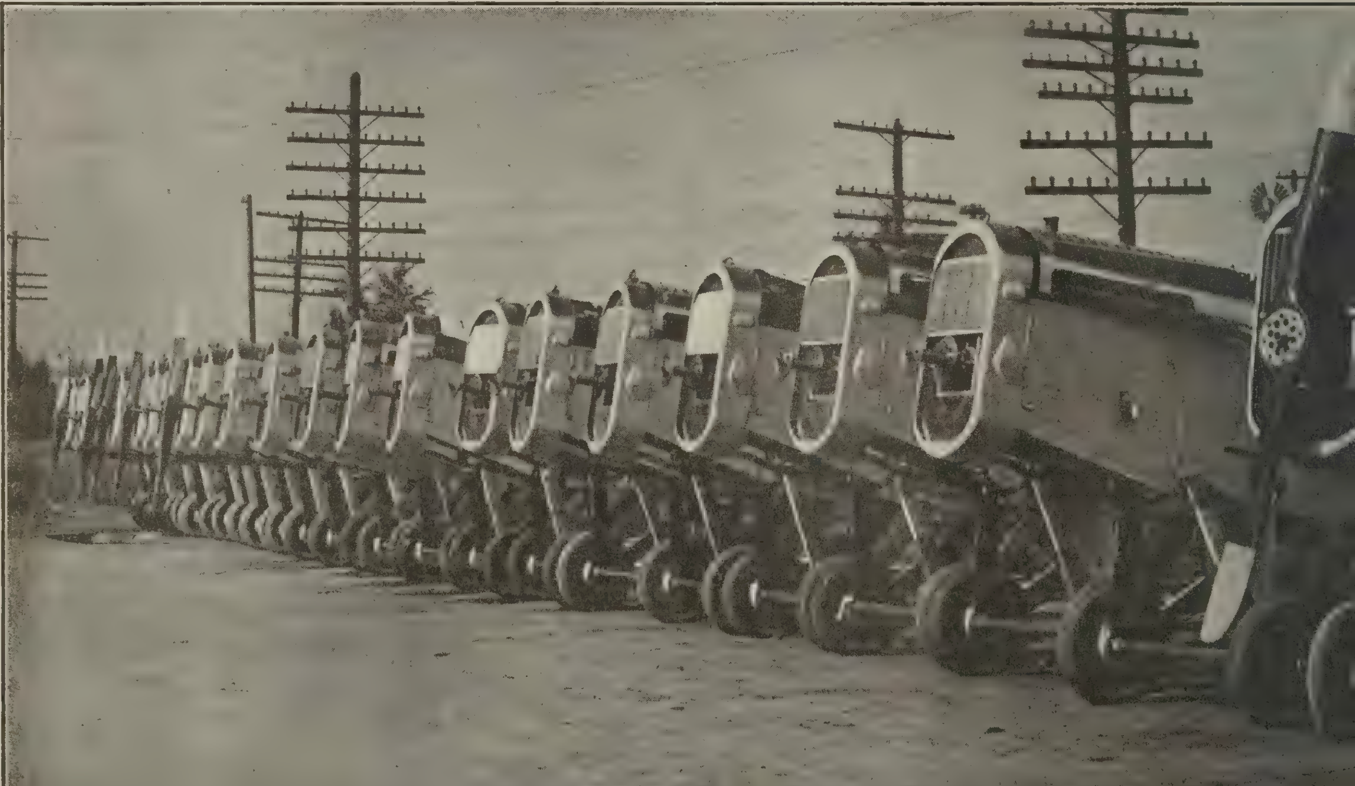
SOME OF THE
AMERICAN PR



An American made propeller on an American made Gnome motor

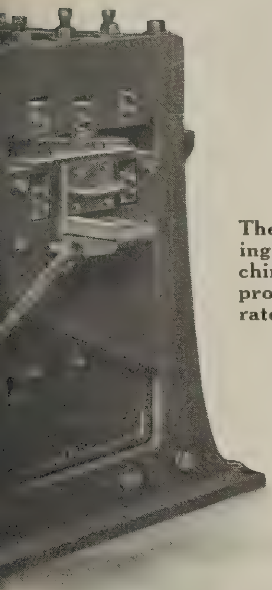


The Westmore Army Propeller

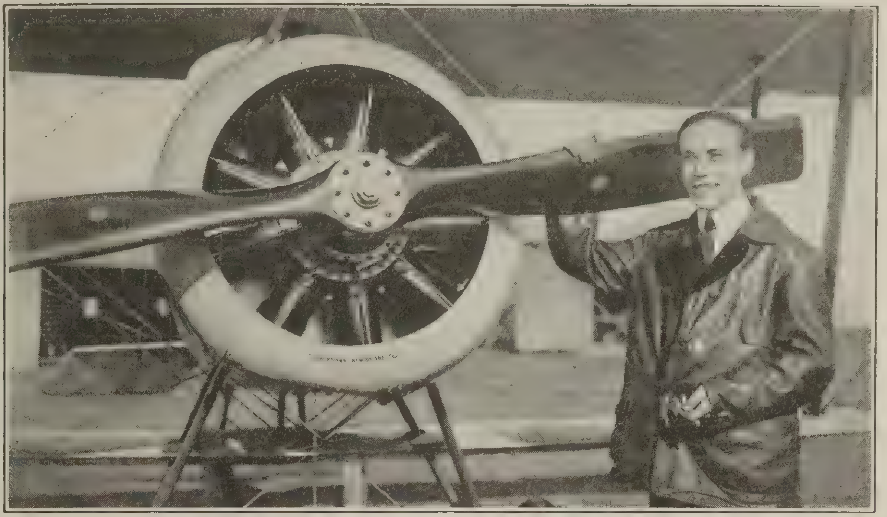


At four-thirty on July 31st the Dayton-Wright Airplane company shipped their thousandth De Haviland Battleplane, completing on
This remarkable photograph, published by courtesy of the Dayton-Wright Airplane Co., shows one day output of that plant. That day was June
becoming substantial. The propellers on these D

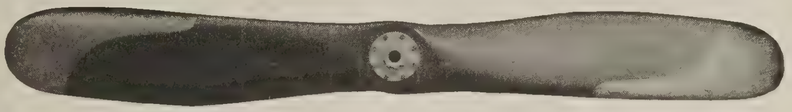
ODUCTS OF THE ELLER INDUSTRY



The Whitney Scraping and Toothing Machine, which tooths propeller stock at the rate of 100 feet per minute



The special propeller on the Berckman Speed Scout



The Westmore Navy Propeller

le time, to the hour, their programme laid down last April, when they finally received the complete information for the DeHaviland Plane
Since then the production of DeHavilands equipped with Liberty Motors, has increased at the Dayton-Wright and other plants, and deliveries are
ds are mostly metal-tipped, but one is shown not tipped

of course, have a performance intermediate between that of the conventional gasoline engine and that of the engine with constant torque. This analysis is applicable equally to a steam turbine and is perhaps of more interest in relation to a steam turbine, owing to the range of speed involved.

In comparing the performance of the airplane and propeller at 20,000 ft. altitude and at the ground, we will assume:

1. Speed of airplane at ground level, 130 f.p.h., or 191 f.p.s.
2. Output of engine, 356 hp. (at 1400 r.p.m., or 23.3 r.p.s.).
3. Diameter of propeller, 11.5 ft. (area 104 sq. ft.)
4. Total lifting surface of plane, $S = 420$ sq. ft.
5. Total weight of loaded plane, $W = 3400$ lb.

The value of K_y in absolute units is computed from the formula

$$W = \frac{\rho K_y S V^2}{g} \qquad (4)$$

$$K_y = \frac{3400}{0.00238 \times 420 \times 191^2} = 0.0933. \qquad (5)$$

The corresponding value of K_y K_x may be taken as 12.3.

(To be continued)

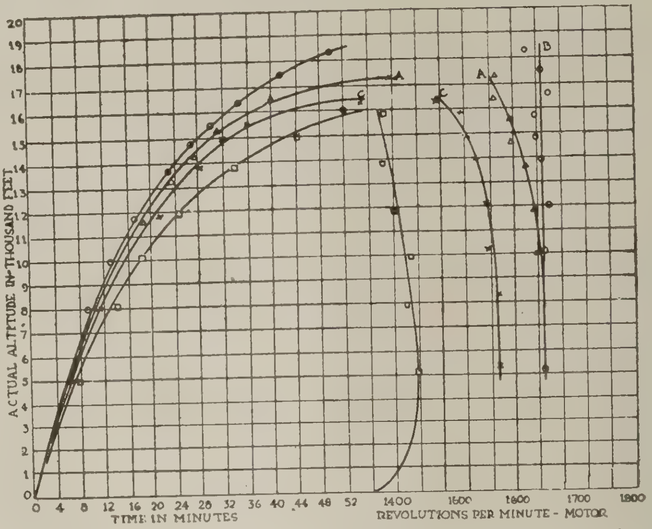


Fig. 12—Comparison of climbing tests of adjustable-pitch propeller

A—Pitch set at ground *C—Pitch set to check with D*
B—Pitch changed during climb *D—Solid wood blade*

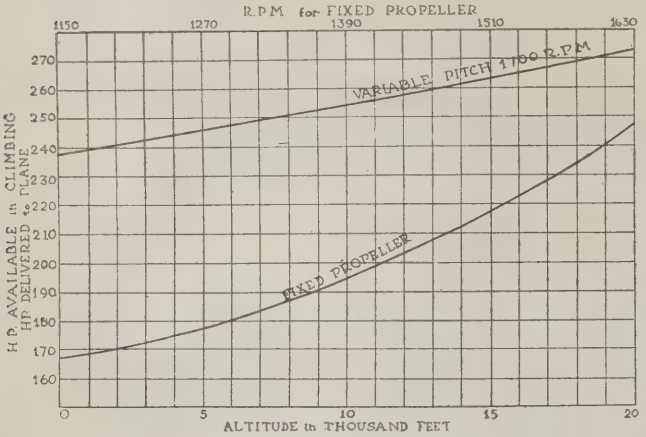


Fig. 13—Performance of propeller for constant torque engine

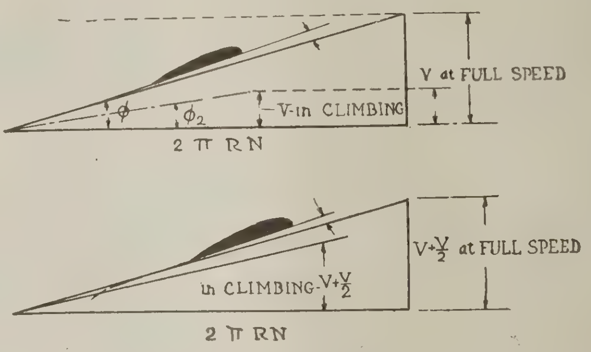


Fig. 10 (above) and 11 (below)—Effect of plane velocity on angle of attack

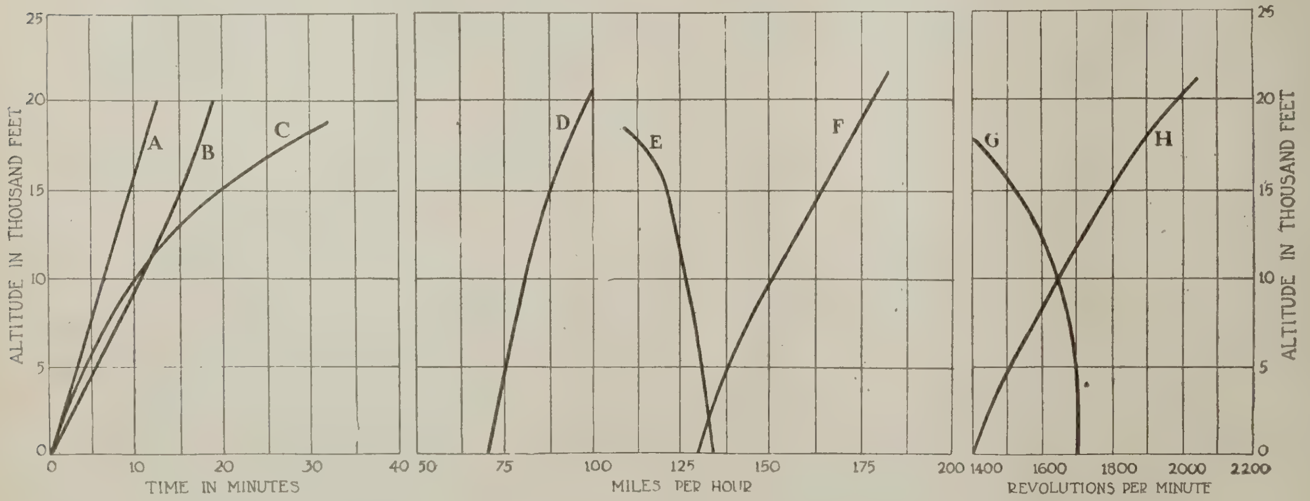


Fig. 14—Climbing and level flying performance of airplane with constant torque compared with that of a plane with a conventional gas engine

A—Time to reach altitude with a constant torque engine B—Time to reach altitude with a constant torque engine and fixed propeller C—Time to reach altitude with a conventional gas engine turning at 1650 r.p.m. near the ground, and with a fixed propeller D—Best climbing speed for airplane. E—Level flight with conventional gas engine. G—R.P.M in a level flight with a conventional gas engine and fixed propeller. H—R.P.M. in a level flight with a constant torque engine

Capt. B. B. Lipsner Appointed Superintendent of Aero Mail

Capt. B. B. Lipsner, who recently resigned his commission as an army flyer, has been appointed superintendent of the aerial mail service of the Postoffice Department, in charge of operation and maintenance, and took his new office on July 17th.

Concerning the possibilities of the service, Captain Lipsner said: "There is no question as to the usefulness of the aerial mail service, as far as the speed is concerned. I will, inside of a limited time, have flying mail routes between points that will actually save over two days compared to the rail service. Of course, two days is not saved between Washington and New York, but that is only a short distance.

His Maxim

The plan upon which Captain Lipsner will develop the service is based upon the maxim, "Do one thing well before attempting another task."

The captain said: "I am going to make the route between Washington and Philadelphia an absolute success before I start any others. So far, it has been a successful experiment." Speaking about the personnel of the future aerial staff, the captain said: "It costs money to train aviators, and many of the men 'over there' have no other profession than flying. These men will be given posts in the aerial mail service when they return.

To Get Machines

"Under an act of Congress, the War Department is instructed to turn over to the Post-office Department all flying machines that have been made unfit for war. This will help us greatly. With a large number of machines and a large number of men with which to man them, the extensive system of aerial mail service is practically unlimited."

Voicing his confidence and enthusiasm in the project, Captain Lipsner said: "I have utter confidence in the future of the aerial mail service. Otherwise I would not have been persuaded to resign my commission in the army; but the future success of the mail service is certain."

The Post Office Department authorizes the following:

Capt. B. B. Lipsner, United States Army, has resigned his commission in the Army to accept the appointment as Superintendent, Aerial Mail Service, in charge of operation and maintenance, effective July 15. Capt. Lipsner has been recognized as an authority on transportation and mechanical maintenance. He has assisted the Post Office Department in the installation of its Aerial Mail Service. He was appointed to the Army May 15, 1917, from Chicago, which has been his home. Capt. Lipsner's headquarters as Superintendent of the Aerial Mail Service will be in Washington.

Statement by Capt. Lipsner

Capt. Lipsner makes the following statement:

"I have acepted the honor of being appointed the first Superintendent of the Aerial Mail Service because I feel confident of its future results as a speedier mode of mail delivery. The extension of the service is sure to follow when the personnel becomes fully established."

"The position of Superintendent, Aerial Mail Service, was tendered Capt. Lipsner," said Second Assistant Postmaster General Praeger, "in anticipation of the ultimate taking over of this service by the department, with its own equipment and personnel. Capt. Lipsner is thoroughly conversant with the administration of aerial service, and is one of the best authorities on motor transportation in this country. Through the kindness of the military authorities he has already been able to render the department valuable assistance in developing the Aerial Mail Service."

Staff at the Belmont Park Air Mail Station. From left to right: H. L. Hartung, in charge for the Post Office Department; Lieut. T. H. Webb, Lieutenant in charge for the Army; Lieut. Walter Miller, mail carrier

Air Mail Gets Heavier

The heaviest mail carried since the aerial service was established was delivered at Belmont Park on July 15th by Lieut. Gordon Dodge, who had eleven sacks weighing 251 pounds. Monday usually is a light day, but this weight was exceeded only on the inauguration days of the service when many souvenirs were sent by officials.

Aeroplane mail was carried from Washington to New York on July 10 in 2½ hours, including the stop at Philadelphia.

The average rate of speed for the entire trip was over 90 miles per hour, and that between Philadelphia and New York was 108 miles per hour. Lieut. Dodge left Washington at 11.28 a.m. with 211 pounds of mail, arriving in Philadelphia at 1 p.m., making the distance of 135 miles in 1 hour and 32 minutes. Lieut. Miller left Philadelphia at 1.08 p.m., with 134 pounds of mail, arriving in New York (distance 90 miles) at 1.58 p.m.

The mail from New York arrived at Washington at 3.30 p.m., flying through the storm.

During the month of June the Aero Mail Service made the remarkable record of falling below 100 per cent only six times. Since June 12 it has fallen below 100 per cent only once.

Below is a statement sent out by the Washington City Postoffice.

Reduction in Air Mail Postage Rates

The quantity of mail sent by aero mail service since its inauguration May 15, 1918, has been such as to justify the Department in reducing the rate of postage to 16 cents for the first ounce or fraction thereof and 6 cents for each additional ounce or fraction thereof, of which ten cents shall be for special delivery service. Only first class matter is accepted, including sealed parcels not exceeding 30 inches in length and girth combined. The postage on aeroplane mail shall be fully prepaid with special aeroplane postage stamps or with ordinary postage stamps in which event the mail shall be indorsed "By Aeroplane."

The following data for the month of June, 1918, is given for the purpose of showing the regularity of the mail service now being rendered by the aeroplanes and the reliability which may be placed in it by the patrons thereof.

Total possible number of flights	100
Total perfect (uninterrupted) flights made	88
Total interrupted flights made	8
Total flights defaulted on account of weather	4

The new rates are cheaper than telegraph and telephone rates, and the average time of transmission is much faster than train service. The rates are but little higher than straight special delivery service, but the time of transit is considerable less.

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

BY sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aero post service each, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M.		A. M.		A. M.		A. M.
G. P. O.	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq.	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times	10.40
D	10.20	O	10.35	Y	10.30	Tomp	9.40
F	10.30	P	10.20	College	10.05	Tremont	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent.	10.55	Wash.	9.46
I	10.20	T	8.35	H. G.	10.00	W. F.	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

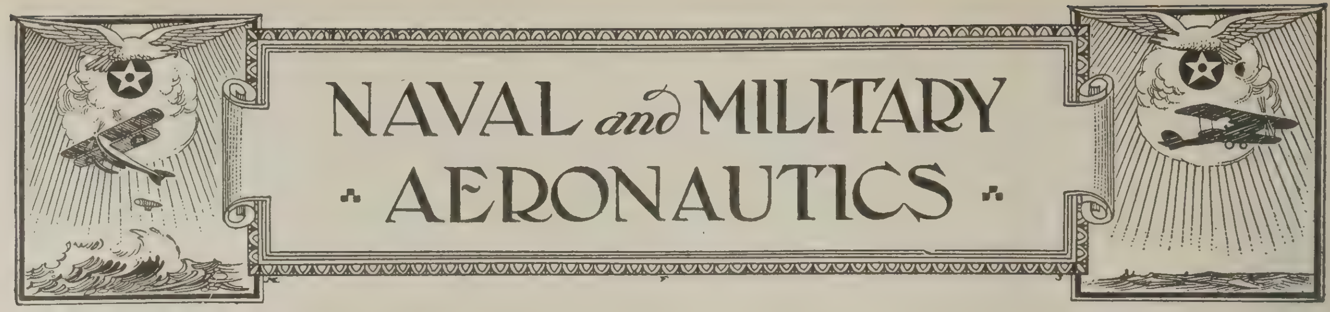
The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only three cents (3c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making sixteen (16c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.



NAVAL *and* MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR -Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego. Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Air Service Recruit receiving Station, Fort Wayne. Mich.
Note 3—Report to Chief of Staff.
Note 4—Report to District Production Office, Garfield Bldg., Detroit, Mich.
Note 5—Report to Aviation Gen. Supply Depot, Middletown, Pa.
Note 6—Report to Dis. Mgr. of Finance, Bureau Aircraft Production, New York City.
Note 7—Report to Capt. J. J. Newman, Signal Corps, Dayton, O.
Note 8—Report to Supply Officer S. C. Photo Supply Depot, New York City.
Note 9—Report to Col. Ira L. Reeves, I. G. Dept.
Note 10—Report to Capt. E. B. Lausier, 480 Lexington Ave., New York City.
Note 11—Report to Standard Aircraft Corp., Elizabeth, N. J.
Note 12—Report to District Manager, Bureau Aircraft Production, Deroit, Mich.
Note 13—Report to Dis. Mgr., Bureau Aircraft Production, 480 Lexington Ave., New York City.
Note 14—Report to Dis. Mgr., Bureau Aircraft Production, 25 S. Main St., Dayton, O.
Note 15—Report to Camp Greene, Charlotte, N. C.
Note 16—Report to C. O., Bustleton, Pa.
Note 17—Report to Lee Hall, Virginia Army Balloon School.
Note 18—Report to School Radio Mechanics, Pittsburgh, Pa.

Special Orders 158 to 163, Inclusive

A

Arthur, William H.	DIK
Archibald, James A.	TFT
Adams, James S.	TFT
Aubuchon, Joseph M.	DIS
Ainslee, James Elliot	OBS
Allen, Leonard Schoolcraft	OBS
Atkins, Harry Clifton	OBS
Anderson, Emil S.	RSD
Arnold, Henry H.	AIR
Acheson, Alexander M.	EOT
Elling, Kenneth Slade	AAD
Appleton, James L.	EOT
Atkinson, Bert M.	AIR
Ammerman, Karl J.	RSD
Anderson, Walker	FRF
Andrews, John P.	DIK
Allen, Albert A., Jr.	DIK
Anderson, Arnold A.	FRF
Allard, John S., Jr.	GLC

B

Bagley, Harvey B.	LHV
Burnett, Robert L., Jr.	TMA
Battles, Winthrop H.	WFO
Bridge, Robert B.	HHN
Bolsinger, Ray C.	DIK
Barrett, John M.	ALF
Back, George I.	FLR
Barrett, Charles	CPR
Brooke, Leon C.	DIK
Bassett, Lowell W.	DIK
Burtis, Edwin S.	DIK
Brown, Harry L.	CPR
Bissell, Paul L., Jr.	TFT
Bennett, Robert K.	DIK
Bell, Richard M.	DIK
Bowman, Charles E.	TFT
Bacon, Benjamin Seldon	OBS
Bagley, James Knox	OBS
Batson, Shelby Howard	OBS
Besse, Gerard C.	OBS
Bordon, Frank Kennon	OBS
Bouquet, Ulrick Louis	OBS
Brothers, William Franklin	OBS
Brown, Edward	OBS
Brubaker, Lawrence	OBS
Bruett, William Frederick	OBS
Burditt, Rollin Ashur	OBS
Burnett, Hunter Tennille	OBS
Baron, Leo Ambrose	AAD
Bash, Henry Edwin	AAD
Blanche, Eugene Hornby	AAD
Booze, Ralph Walker	AAD
Brown, Wayland Hoyt	AAD
Butner, John C., Jr.	AIR
Barnett, Robert M.	AIR
Bassford, Curtis A.	AIR
Breese, Clinton S.	AIR
Belcher, Fred W.	DMA
Blanford, James T.	FRF
Bracket, Joseph T.	FRF
Byrnes, James E.	APR
Backus, Clinton J.	SMM
Bean, Herbert S.	SMM

Byington, Marsh M......FRF
Brass, Thomas......MJR
Brooks, John B......AIR
Booth, Harold W......PFO
Barnes, Kenneth G......FRF
Beam, Rosenham......DIK
Bell, Harold D......SRC
Boggs, Stanhope S......BST
Bloodworth, Thomas S. M......PMT
Beck, Daniel H......EOT
Bartholomae, William A., Jr......EOT
Bunn, Charles......PFO
Barler, Richard C......PFO
Bowen, Thomas S......AIR
Burge, Vernon L......AIR
Butler, William H., Jr......MAC
Budd, Dennison M......PFO
Bardwell, Allen E......CMV
Britton, Ralph R......PFO
Bacon, Oliver G......PMT
Bramlette, James L......PFO
Blair, Samuel A......RSD
Brown, Alvin M......CAF
Balbach, Nyle J......PMT
Black, Avery J......RSD
Braymen, Kenneth C......PFO
Bonesteel, Charles H......WFO
Boatright, Bernard D......FRF
Brya, Edward G......GLC
Bakala, Chester C......FRF
Brown, Kenneth P......GLC
Brown, Ernest L......FRF
Bryant, Dan J......FRF
Bedell, James W., Jr......DIK
Bennett, Fred C......DIK
Benham, Reid F......GLC
Bunn, James H......DIK
Bryan, Joseph St. George......Note 11
Bell, Charles R......Note 13
Bishop, Miller V......Note 15

C

Crow, Homer L......FRF; BST
Clinton, Ambrose V......FRF
Carveth, Walter W......FRF
Crozier, George H......BFT
Cowing, Guy R......FLR
Calhoun, Ben A......TMA
Campbell, Dudley R......ALF
Crandall, Gavin D......DIK
Colvin, Rrthur D......TFT
Crane, Emerson P......VBW
Cowell, Charles L......VBW
Conrad, Charles ......FOB
Cundiff, William Isaac......OBS
Curran, Cyril Joseph......OBS
Curry, John F......AIR
Chapman, Carleton G......AIR
Cannon, George ......OBS
Carter, Henry ......OBS
Chadbourne, Horace......OBS
Chaffee, Raymond Osgood......OBS
Cochran, Thomas Beaufort, Jr......OBS
Canady, Earl L......AIR
Carvin, Charles W......FRF
Christie, Arthur R......AIR
Campbell, Horace A......AIR
Chadbourne, Horace......AIR
Caley, John L......SMM
Cook, Joseph R., Jr......SMM
Chamberlain, Leo W......PFO
Clark, Horace......PFO
Clark, Arthur F......PFO
Collier, Trezevant......PFO
Carolin, Norbert......CPR
Christman, John H......SLT; DMA
Cary, John Barry......SMM
Cole, Melverne C......AAD
Callanan, Edward Agnew......CPR
Cross, Frederick R......PFO
Chandler, Charles Def......AIR
Clark, Virginius E......AIR
Carberry, Joseph E......AIR
Coad, Ralph G......MAC
Campbell, Hayden S......PMT
Chambers, Lilburn B......AIR
Chalfont, Harvey E......PFO
Cochran, Thomas B......UTA
Cole, Robert A......PFO
Chapman, Harold C......PFO
Collier, David C......LHV
Conner, Lawrence H......FRF
Carlson, Arthur G......DIK
Cole, Bert L......DIK
Crittendon, William R......GLC
Cristy, Wynn O......DIK
Carlson, Frank N......FRF
Condron, George T......GLC
Crawford, Noble R......GLC
Covington, Euclide M......GLC
Circle, Ralph E......DIK
Cary, Malcolm C......DIK
Casey, Mathew A......DIK
Cheney, Christopher A......Note 17
Caldwell, Hazlitt B......Note 8
Cook, Roland E......Note 14

D

Drake, Robert A......FRF
Dawson, Thomas E......DIK
Douglass, Julian Cedric......FLR
Dreese, Erwin E......FLR
Daniell, Sidney S......OBS
Dean, Henry Herbert......OBS
Duckett, Thomas Paul......OBS
Duncan, Asa North......OBS
Dyke, Cyde Evert......OBS
Donovan, Lawrence J......FRF
Dixon, Jerome J......FRF
Davies, Stuart J......FRF
Douglas, Bernard M., Jr......PFO
Daiger, Charles V......FRF
Dorland, Chester ......DIK
Davies, John P......DMA
Dodd, Townsend F......AIR
Dargue, Herbert A......AIR
Doherty, Chester C......EOT
Dorris, William L., Jr......EOT
Daniel, Lloyd A......EOT
Druffner, Karl M......FRF
Dorr, Philip J......FRF
Denny, Hugh R......GLC
Dievendorff, Horton H......GLC
Durand, Eugene ......DIK
Dwyer, Lawrence P......FRF
Denick, Milo F......DIK
Dickey, Ralph C......Note 9

E

Eberle, Sidney S......FRF
Edwards, George B......CFT
Eastman, Andrew J......DIK
Eager, Alfred G......TFT
Eckert, John J......CAP
Evans, Stephen G......DIK
East, John Howell......OBS
Ellis, George Wilson......OBS
Eby, Allen Dale......AIR
Eddy, Arthur Edwin......OBS
Eastman, Stanley E......BST
Eby, Samuel H......DIK
Eddy, John L......GLC
Ellis, Robert E......DMA

F

Fitzpatrick, William H., Jr......LHV
Felton, James B......IMA
French, Jasper J......DIK
Ferris, Walton C......TFT
Farmer, William Henry......OBS
Farnsworth, Austin Manchester......OBS
Fay, Samuel Prescott......OBS
Fisher, Theodore Walter......OBS
Foster, Austin Theophilus......OBS
Franklin, William Easly......OBS
Frazier, Edward Jordan......OBS
Fuller, Wiley Madison......OBS
Farwell, Albert Day......CAP
Fitzgerald, Shepler W......AIR
Fauvre, Irving Maus......OBS
Finter, Clyde Virginius......OBS
Fisher, Robert Thomas......CPR
Florian, Charles H., Jr......MAT
Fuller, Clifford J......CGC
Fish, Eugene R......AIR
Flourney, William R......FRF
Foulois, Benjamin D......AIR
Fox, Edwin H......FLR
Fransden, Arthur S......FRF
Fisher, Ernest A......AIR
Flowers, Leslie D......UTA
Fletcher, Ward B......FRF
Folz, Charles J......DIK
Farrell, John B......PFO
Fenwick, Herbert F......BST
Fuss, Eli S......CDT
Fox, Herbert F......GLC
Frost, John A......GLC
Foltz, Joseph R......DIK
Fitzgerald, Harold A......GLC
Fox, Edwin H......Note 12

G

Good, Francis J......DMA
Gillet, Charles B......UTA
Graves, Henry L......TFT
Graves, Gilbert S., Jr......TFT
Gray, Leslie R......DIK
Green, William S......DIK
Guthrie, Ralph R......CAP
Garrison, George G......AIR
Gravely, William S......AIR
Garlies, George ......OBS
Gillett, Robert Swift......OBS
Goldthwait, Joel Addison......OBS
Gravely, William Seymour......OBS
Graves, Nelson M......OBS
Goldsborough, Paul......CPR
Graham, Charles F., Jr......FRF
Gillis, Roger......SLR; VBW
Gorrell, Edgar S......AIR
Gallagher, Edward M......CMV
Glenn, Grosvenor E......CMV
Grazier, Oliver E......EOT
Gaile, James C., Jr......EOT
Grady, Henry L......OBS
Grimes, Gerald E......EOT
Gordon, James B., Jr......EOT
Gaylor, Percy Whitmore......VBW
Grose, Ronald ......FRF
Gustafson, Charles R......FRF
Geib, Willis F......DMA
Gordon, David W......FRF
Gruny, George R......FRF
Gleason, William Fogarty......FLR; Note 3
Gregg, Dean B......Note 5

(*Continued on page* 1028)

The doorway of the headquarters of one of our aviation schools. Seen hanging up on the wall are the different insignias of our aero squadrons. Each squadron on its formation adopts some special insignia by which it is known and upon leaving the school this insignia is hung upon the wall as shown above. (Committee on Public Information)

FOREIGN NEWS

BELGIUM

A Belgian statement issued on July 24th said:

"An aeroplane flying over Boitshoucke was brought down by anti-aircraft guns. Sub. Lieut. Coppens, whose predilection for war balloons is becoming noticeable, celebrated Belgian Independence Day by a new exploit. Seeing a string of 'German sausages' near Ypres, he went up in spite of bad weather, and set two of them on fire; the Germans hurriedly hauled in on the others, but Coppens dived to within 100 yards of the ground and got one more, bringing his record for war balloons to eighteen.

"During the night of the 21st a Gotha, flying over the sea toward Dunkirk, was hit by anti-aircraft guns and fell, with three passengers, in the inundated sector of Pervyse. The same day an enemy aeroplane was destroyed near Warhem likewise by artillery fire."

FRANCE

The official report of the War Office issued July 20 says of aerial operations:

"Our aviators, redoubling their activity in the day and night of the 19th, multiplied their raids and engaged in the severest battles against enemy forces. Franco-British bombing squadrons, taking the Marne crossings as their principal objectives, have ceaselessly hampered, and at certain points completely stopped, the enemy supply service, thus playing an important rôle in the conflict which was about to provoke the retreat of the German troops.

"Attacking with machine guns and bombs concentration of troops which the enemy was preparing for counter-attacks, and his columns of convoys, our aviators inflicted heavy losses on the enemy.

"On the Marne and also at Oulchy-le-Chateau, Fere-en-Tardenois, Fismes, and Bazoches and over the whole rear of the battlefield 24 tons of projectiles were dropped during the day and 28 tons at night on enemy assemblages of troops and communications.

"A violent conflagration broke out at Vouziers, and several fires were started at Fere-en-Tardenois and the station at Fismes. South of this region explosions were observed at the station at Laon. Simultaneously our infantry aeroplanes indicated an advance of our troops and tanks between the Aisne and the Marne and reported the arrival of enemy reserves, and by machine gunning the latter directly participated in the battle.

"Numerous combats were engaged in by our crews in conjunction with the British airmen and achieved good results. Twenty-six German aeroplanes were brought down or disabled and four captive balloons were set afire. Everywhere the German aviation service was able to appreciate the dash and superiority of the allied airmen."

The French official issued on July 22 said of Aviation:

"Tens of thousands of cartridges were fired at German troops and batteries, which were silenced, in the region of Courmont, Roncheres and Villeneuve, the same day. Our aviators brought down nine enemy machines."

The French War Office statement in describing aerial activities says:

"On July 22 the work of our aerial forces continued along the whole battle front very actively. Franco-British squadrons fought numerous combats, which cost the enemy heavy losses. Thirty-seven German aeroplanes were brought down or put out of action, and four captive balloons were set afire.

"Bombing operations were continued in the same methodical way as on preceding days and with good results. Enemy concentration points, bivouacs, communication links were bombed with twenty-nine tons of projectiles. British bombing planes dropped forty-one and a half tons of explosives on aviation grounds and stations in the rear.

"On the night of July 22-23 an expedition against the railroad station at Maison Bleue attained its object. Thirteen hundred kilos of projectiles were dropped on buildings and standing trains in this station. A great fire broke out followed by violent explosions.

"American fighting and observation planes with impetuosity and bravery consistent with the troops of the United States cooperated in previous raids and took part in the successes won by our aerial forces."

The French official says on July 25:

"Aviation—On July 24 Franco-British airmen brought down nine German machines and set fire to three captive balloons. Our bombing machines carried out numerous expeditions behind the battle zone. The station and depots at Amifontaine, the stations and railroads at Bazoches, Courlandon, Fismes and Cugnycourt were copiously bombed. A total of thirty tons of projectiles was used with good results. Fires and heavy explosions were observed at Courlandon and Fismes."

Storms and low clouds hampered the work of our aviators. Eleven German machines were downed by anti-aircraft guns. French and British aviators have made several raids into the battle zone and six tons of explosives were dropped on bivouacs, convoys and concentration points of the enemy.

Second Lieut. Fonck downed seven machines in four days, making fifty-six machines that have been downed by this pilot.

GREAT BRITAIN

The following official communication was issued by the Admiralty on July 19, dealing with the navy's aerial activities:

"During the period between the 11th to the 17th of July, inclusive, Royal Air Force Units, working with the navy in home waters, have maintained the anti-submarine and escort patrols. Bombing raids have been carried out when the weather was favorable with good results.

"Enemy destroyers have been sighted off the Flanders coast on several occasions and attacked with bombs. A direct hit was botained on one large destroyer.

"Our formations also have attacked destroyers with machine gun fire. On one of these occasions five enemy seaplanes approached at the beginning of the action, but immediately withdrew.

"Enemy aircraft have been active and have attacked our bombing and patrol formations. Three hostile machines have been destroyed or driven down out of control."

The British Admiralty announced on July 20th:

"A detachment of the grand fleet operating off the Jutland coast on the morning of Friday, July 19, has returned to the base, having carried out a bombing attack on the Zeppelin sheds at Tondern, Schleswig, by Royal Air Force machines despatched from the vessels.

"In the first flight, which was made in the early morning, all the machines reached their objective and made direct hits on a large double shed, which was destroyed, the conflagration rising to 1,000 feet.

"A second flight followed the first, all our machines but one reaching their objective. A large shed was observed to have a hole of considerable dimensions in the roof, from which a volume of smoke was being emitted. A second shed was bombed and direct hits were made, but owing to the fierce anti-aircraft fire and to the smoke of the first shed it was not possible to observe whether the destruction of the second shed was complete.

"The attacks were made from a height of 700 to 1,000 feet. Four of our machines failed to return and information has been received that three of these machines landed in Danish trritory.

"An announcement from the Air Ministry says that bombs were dropped on the Benz Works at Mannheim, on the railway station at Heidelberg, on blast furnaces in the Saar district and on a powder factory at Oberndorf. A fire resulted at the Benz Works. Railway trains also were attacked."

The official report on aerial operations issued July 20th says:

"Early on July 19 several long reconnaissances were carried out by us and many photographs were taken of the enemy's back areas. Work with the artillery and bombing were continued throughout the day.

"Over seventeen tons of bombs were dropped on hostile ammunition dumps, railway stations and aerodromes. In one of the raids on a hostile aerodrome the machines dropped their bombs from between 100 and 500 feet. One pilot landed on the aerodrome and swept the hangars with his machine gun before rising again.

"Ten hostile machines and six balloons were brought down. Seven of our machines are missing.

"After dark, although there was a strong west wind blowing and low clouds continually drifting up, our machines dropped fourteen tons of bombs on the railways between Mons and Valenciennes and on the stations at Cambrai, Lille and Saclin, a direct hit being obtained on a train at the last named place. All our machines returned.

"Our bombing squadrons again were active during the night of July 18-19. At the Benz Works at Mannheim, the railway station at Heidelberg and the blast furnaces at Burbach and Wadgossen were attacked. At Benz Works a fire broke out. A hostile aerodrime was attacked, one of the hand-cars receiving a direct. Two trains were hit by bombs, brought to a standstill, and then subjected to machine gun fire.

"On July 19 the powder factory at Oberndorf, (on the Neckar, southwest of Stuttgart) was attacked. Bursts were observed on the buildings in the factory. All our machines returned safely."

The communication from the Air Ministry says:

"On the night of July 19-20 our bombing squadron carried out several air raids. At Mannheim attacks were made on the Badische Aniline and Soda Works, the Lanz Chemical Works, the Gebruder Guilini Chemical factories, and the docks.

"A fire broke out in the Badische Aniline Works and clouds of smoke rose from the Gebruder Guilini Factories. Two hostile aerodromes were again bombarded with good effect. Trains and road transports were attacked at low altitudes with bombs and machine guns. One of our machines did not return.

"On the day of the 20th attacks were made on the railway factories at Offenburg and Oberndorf. At the former place one of the large engine sheds was hit and at Oberndorf bursts were observed on factories and railways. Our formations were heavily attacked. One hostile machine was destroyed and two were driven down out of control. Three of our machines have not returned."

The following official communication dealing with aviation was issued July 21st:

"On the 20th inst., except in the early morning, the weather again was unsuitable for photography and long distance reconnaissances. It did not prevent our aeroplanes from bombing on the front and carrying out close reconnaissances and observation for the artillery throughout the day.

"Eighteen tons of bombs were dropped by us on different targets, including the Courtrai and Lille railways, the Bruges docks, three large ammunition dumps and hostile billets on various parts of the front.

"Slightly more fighting took place than on the previous day and fourteen enemy machines were brought down. Three other hostile machines were driven down out of control and three German observation balloons were destroyed.

"Seven of our aeroplanes are missing.

"As a result of a photographic reconnaissance carried out on July 20 extensive damage was revealed at the hostile aerodrome at Morhange, attacked on the night of July 19-20. One large shed and three hangars were destroyed."

GERMANY

The Berlin statement of July 23rd said:

"Fity-two enemy aeroplanes and four captive balloons were brought down yesterday."

A dispatch from Amsterdam dated July 22, said:

"Lieutenants Friedrichs and Kirschstein, members of the van Richthofen squadron, have been killed, says the *Lokal-Anzeiger*.

"Friedrichs was credited with twenty-one victories and Kirschstein with twenty-seven."

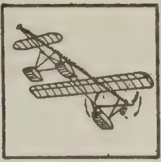
ITALY

A dispatch from Rome says:

"On July 23rd an Italian flier attacked an Austrian bombing squadron in the moonlight. One machine was downed and fell in Treviso. Both occupants of the machine were wounded and made prisoners. The Italian turned his gun an another aeroplane which also crashed down near Capo Sile and both occupants were drowned."

MODEL NEWS

Edited by John F. McMahon



CLUBS

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98th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
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TEXAS MODEL AERO CLUB
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304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
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c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Model Aeroplane Building as a Step to Aeronautical Engineering

We have now passed the elementary subjects of our course, and we will begin work on the more advanced types of model construction.

I would advise the model builders to keep in mind all the things we have passed over before attempting the harder models because if one thing is forgotten, the result will be, the model will not be constructed properly and when attempting to fly will smash on the ground, this will be the reward for all the work put into it.

When constructing the models to come, it would be advisable to make a full size drawing of the model to be constructed. It is surprising what a saving in work just a simple drawing will do. When using a full size drawing each part can be measured and cut to the proper size and is then ready to assemble.

Another thing to consider is the great number of parts used in a scale model and most of them require a great deal of painstaking and should be given considerable attention because the model is rated by the different details used.

In prize contests for exhibition models, a model is generally rated by the workmanship of the different fittings and metal parts used in the construction.

These metal parts, such as wheels, turnbuckles, shut sockets, axles, terminal sockets, pontoon hangers, radiators, dummy motors, etc., can be bought from model supply houses of which there are at least a dozen in the United States.

The advantage of buying these parts from reputable houses is that they are made right and sell at a reasonable amount. In fact, it is often cheaper to buy them made up than to buy the raw material and construct them yourself.

Care should be taken to properly locate the center of gravity in a scale model and also to place the main plane, otherwise the model will be "out of balance" and the result will be a crash to the ground and the discouragement of the model builder.

We will proceed to construct a typical American Training Machine, namely, the Curtiss JN 4.

(*To be continued*)

The Sikorsky Biplane

The model shown in the accompanying illustrations is of the Giant Russian Machine "Sikorsky." This is the forerunner of the Handley-Page and Caproni machines. A larger and better "Sikorsky" has been built, but nothing much has been heard of this machine.

The model is neatly constructed and is an exact duplicate of its large prototype, even the engines are made exactly to scale. The body is made of mahogany. The crossing of the Atlantic will be made by a machine of this type and models of these large machines should prove of interest to model builders and aeronautical enthusiasts in general.

The model was constructed from drawings and photographs which appeared in Aerial Age.

Correspondence Model Aero Club Disbands

The Correspondence Model Aero Club of Babylon, N. Y., through its Secretary, Mr. Edwin A. Jenkins, notifies me they are compelled to disband on account of the lack of interest and more so on account of the non-payment of dues. The club has been financed in the past by Mr. Thomas F. Stanton, President, and he does not feel as if he can do so any more, as the club is now indebted to him for a considerable amount.

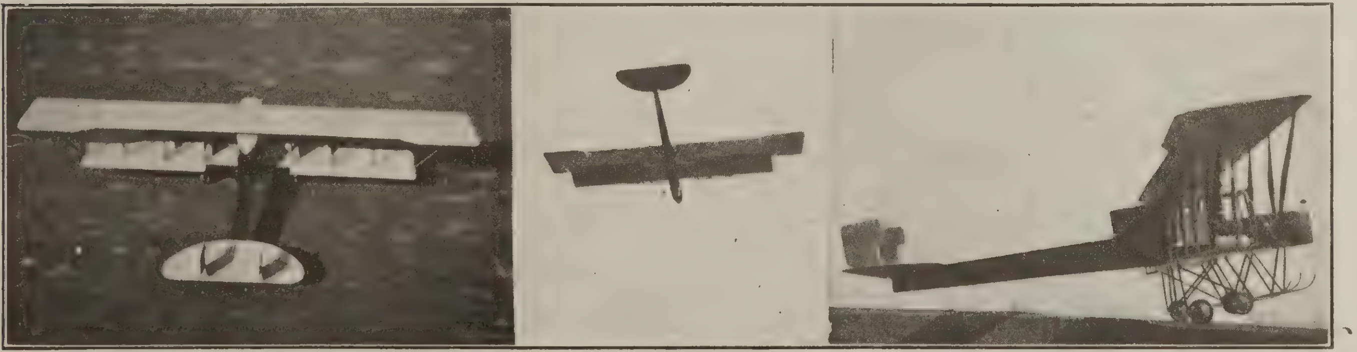
Junior Aeronautical Reserve Has New Member

I have been notified by Mr. C. Kahnis, of 145 Rochester Avenue, Brooklyn, that he has organized a unit of the Junior Aeronautical Reserve to be known as the Eagle Unit. It is his intention to have lectures once a week at the different members' houses by men who are experts in aeroplane building.

Mr. Kahnis is the president of the club and I would advise all model flyers living in Brooklyn or thereabouts to communicate with Mr. Kahnis who will be very glad to give any information necessary.

Wading River Company Issues New Catalog

A very interesting and complete catalog of model accessories and compressed air motors has just been issued by the Wading River Manufacturing Company, 609 Broadway, Brooklyn. It contains all the tools and parts necessary to complete the machines appearing in these articles.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Farmer's Letter to His Sweetheart

(Under Modern Mail Conditions)

I like to get your letters, love, I miss you every day,
I'm dull and sad and desolate whenever you're away.
But if its just the same to you, please make your missives light,
And don't enclose remembrances in everything you write.
This may seem trifling, darling, but it means a lot to me,
For they're using flying postmen on the R. F. D.

Last night a billet doux from you destroyed my Maltese cat,
Just dropped him, ruined in his tracks—the knife you sent did that.
The book of verse that you enclosed to me the other day
Impinged upon the hired man, and now he's gone away.
And hired men are very scarce these busy days to me,
And very hard to come by on the R. F. D.
That cigarette case was a dream, but it was my hard luck
To lean upon the letter box the moment that it struck.
And though I would have rhapsodized on getting it, no doubt,
My joy was somewhat dampened by the fact that I was out.
For when things fall they will fall hard, and when they light on me
I miss the dear old flivvers on the R. F. D.

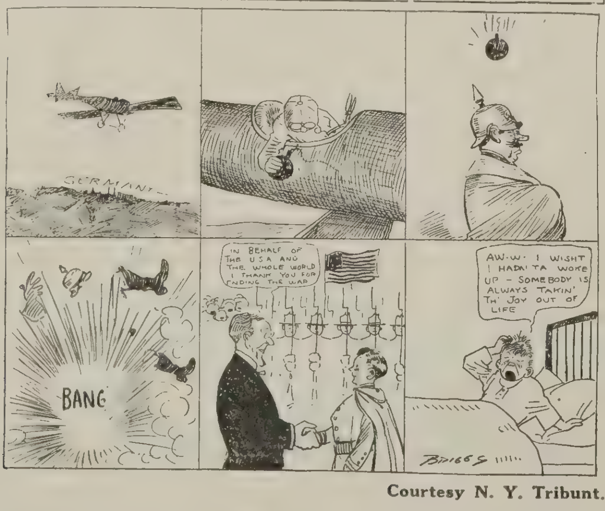
I love you just the same, my dear, as in the days of yore,
And every day that you're away I miss you more and more.
But if you'll write a dozen sheets, instead of sixty-five,
When you return there'll be more chance of finding me alive.
For when it drops five thousand feet, the merest note, you see,
May croak your doting lover on the R. F. D.

I am up in the air. Yesterday morning I was stepping high and thought we would get away from here before the dog days.—*Uncle Joe Cannon.*

No holding the boy! Aviation, pedestrianism—nothing can check his wings and springs of youth.

A truly Gilbertian situation has arisen over the Huns' night bombing of Paris. During the recent attack the Embassy of one of the enemy Empires was damaged by a bomb. Two days later the caretaker of the building applied to the Legation of a neutral state which is charged with the interests of the enemy in question during the war to present to the French Government a bill for the damage. The bill which France is expected to pay for the damage done by the enemy to his own property is over $800. Sherman was right!

Somebody Is Always Taking the Joy Out of Life . By BRIGGS


GERMANY
BANG
IN BEHALF OF THE U S A AND THE WHOLE WORLD I THANK YOU FOR ENDING THE WAR
AW-W- I WISHT I HADN'TA WOKE UP - SOMEBODY IS ALWAYS TAKIN' TH' JOY OUT OF LIFE
BRIGGS

Courtesy N. Y. Tribunt.

The Young Hero of Aire

"There was a young hero of Aire
Who was hit, but he couldn't say where,
Till a comrade close by
Said 'Just sit down and try,'
And he did, and he shouted, 'It's there!'

"There was a young man of Bailleul,
Who was voted a silly young fool;
But he couldn't have been,
For when last he was seen
He was billeted at *the* girl's school!"

"There was a young person of Caestre,
Diana herself was no chaster;
But I own with regret
She's a sister Yvette,
And a cousin Germaine who disgraced her!"

"There was a young fellow of Vimy
Who said, 'if my sweetheart could see me
Accepting the kisses
Of these here French misses,
I guess I would rather not be me!'"

From *Odes to Trifles and Other Rhymes*,
by R. M. Eassie.

Three Pilots

(*After Charles Kingsley.*)

Three pilots went sailing out into the West,
Out into the West as the sun went down;
Each prayed that his 'plane would emerge from the test,
And thought of the plays that were running in town.

For men must fly, though they haven't got wings,
Just think of the ripping adventures it brings,
Though the Flight Commander's groaning!

Three gas-bags loomed up at the midnight hour,
At the midnight hour, when the sun was down;
The observers looked grim and the pilots looked dour,
And the Lewis guns rattled and did the brutes brown.

For men must fly, while the lucky ones sleep,
Dodging through cloud-banks and playing bo-peep,
And the Flight Commander's groaning!

Three pilots strolled up on the shining Strand,
In the morning gleam, when the night went down;
They booked sundry boxes in Theatreland,
And they called on the King for a taste of renown.

For men must fly, though the summit is steep,
And nasty cross-currents may give them the creep,
And the Flight Commander's groaning!

G. R. S.

Aeromarine Seaplane

A wonderful machine, well constructed, beautifully finished, and Valsparred throughout. Used by the U. S. Navy

Valspar is best for Seaplanes

SEAPLANE service is the most exacting in the world. But it doesn't affect Valspar, because Valspar is absolutely immune from water and extremely durable.

Valspar is extensively used on the airplanes and seaplanes of the Allies and the U. S. Government. It has successfully withstood the tests of actual war-service in its most strenuous phases.

Being a long-oil varnish it does not check, crack, or blister. It dries dust-free in two hours and to a hard finish in twenty-four hours. It will not turn white with the severest exposure.

Our Airplane Department is ready to give the benefit of its experience to any manufacturer. A valuable handbook on this subject will be sent to purchasing agents or superintendents of production on request.

VALENTINE'S VALSPAR

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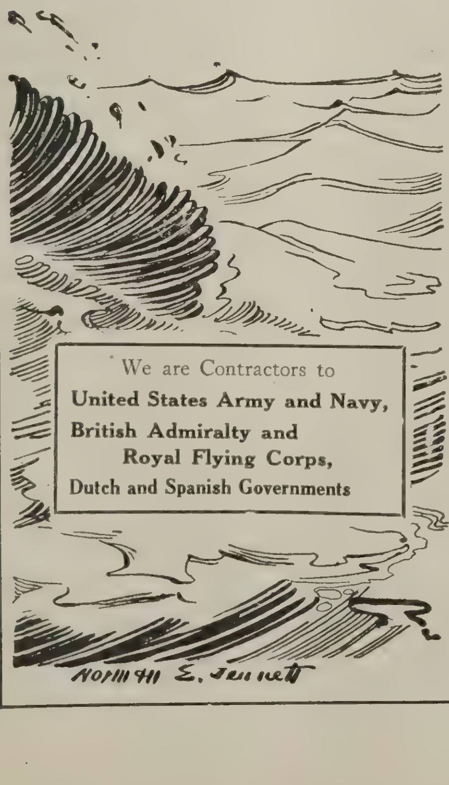

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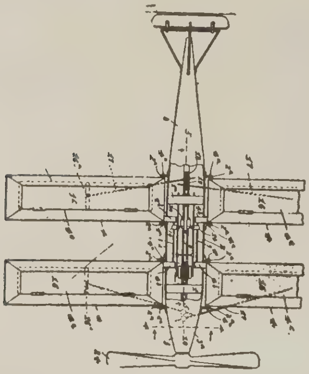
British Admiralty and
Royal Flying Corps,
Dutch and Spanish Governments

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,264,330. FLYING-MACHINE. **Wells M. M. Protzman**, Osborn, Ohio. Filed August 31, 1917. Serial No. 189,202. (Cl. 244—20.)

1. In a flying machine the combination of a body; plane wings hinged to said body on opposing sides thereof and adapted to oscillate on their hinges, said wings being provided with openings; closure members for the openings in the wings hinged to said wings and adapted to open and close by air pressure in the oscillation of said wings; connecting rods between the wings on each side of the machine; levers fulcrumed in the body; means for oscillating said levers; connecting members between said levers and the wing connecting rods, whereby the oscillating movement of the levers imparts oscillation to the wings.

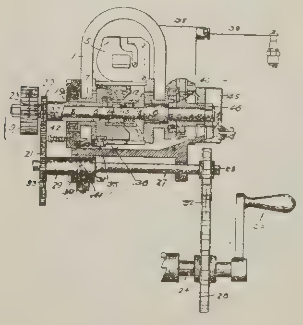


7. A flying machine having wings hinged to the body thereof and adapted to oscillate on their hinges, said wings being provided with openings, flaps hinged to said wings for covering the openings therein, said flaps being adapted to open automatically on the upward movement of the wings and to close against the under side of the wings on the downward movement of said wings, stabilizing rods connected with the flap members, said rods extending to the body of the machine and slidable in universally adjustable friction members attached to said body, and means for oscillating the wings.

(Claims 2 to 6 not printed in the Gazette.)

1,262,534. IGNITION MECHANISM FOR INTERNAL-COMBUSTION ENGINES. **Samuel Christopher McKeown**, Newark, N. J., assignor to Splitdorf Electrical Company, Newark, N. J., a Corporation of New Jersey. Filed June 21, 1916. Serial No. 104,937. (Cl. 123—148.)

1. In combination with an internal combustion engine, ignition instrumentalities including a magneto having a rotatable shaft and a flux shifting member mounted on said shaft, a clutch adapted to operatively connect said shaft and said flux shifting member, means whereby said shaft may be driven from a moving part of the engine, and means for disengaging said clutch whereby the flux shifting member may be rotated independently of the shaft.



2. In combination with an internal combustion engine, ignition instrumentalities including a magneto having a rotatable shaft and flux shifting member mounted on said shaft, a clutch adapted to operatively connect asid shaft and said flux shifting member, means whereby said shaft may be driven from a moving part of the engine, and means for rotating said flux shifting member independently of said shaft, said clutch being constructed so as to permit the flux shifting member to be rotated in the direction of the normal rotation of the flux shifting member by the shaft when said shaft is at rest.

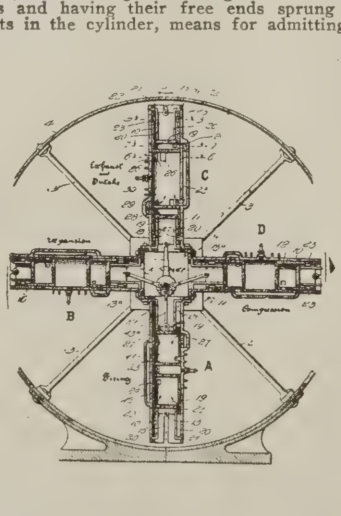
3. In combination with an internal combustion engine, ignition instrumentalities including a magneto having a rotor, a shaft therefor, on which said rotor is mounted, means for connecting the shaft to the rotor when turned in a direction for normal rotation of said rotor, said means permitting the rotor to be rotated in said normal direction when the shaft is at rest, means whereby the shaft may be driven through a moving part of the engine and hand operated means for rotating the rotor when the shaft is at rest, said hand operated means including devices automatically brought into engagement with each other upon the turning of the hand operated means to rotate the rotor and automatically disengaged from each other when the rotor is operated by the shaft.

4. In combination with an internal combustion engine, ignition instrumentalities including a magneto having a rotor, a shaft therefor, on which said rotor is mounted, means for connecting the shaft to the rotor when turned in a direction for normal rotation of said rotor, said means permitting the rotor to be rotated in said normal direction when the shaft is at rest, means whereby the shaft may be driven through a moving part of the engine and hand operated means for rotating the rotor when the shaft is at rest, said hand operated means including gears adapted to intermesh when said hand operated means is rotated in a direction for rotating the rotor and whereby said gears are caused to be disengaged from each other when the rotor is operated by said shaft.

5. In combination with an internal combustion engine, ignition instrumentalities including a magnet, having rotatable members adapted to be driven from a moving part of the engine, a clutch adapted to operatively connect said rotatable members when one of said members is rotated by the engine and means for rotating the other member, said means including an operative shaft having a sliding gear connection with a gear on said last named member.

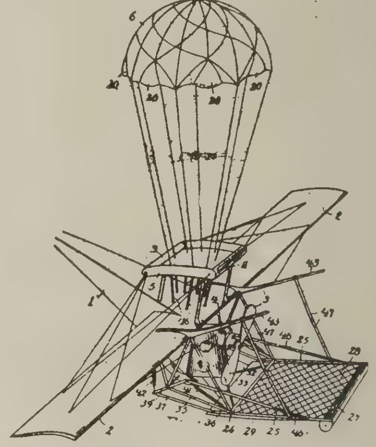
1,263,972. INTERNAL-COMBUSTION ENGINE. **Harvey J. Warner**, Takoma Park D. C., assignor to The U. S. Aviation and Auto Co., Denver, Colo., a Corporation. Filed Dec. 1, 1916. Serial No. 134,441. (Cl. 123—44.)

1. An internal combustion engine comprising a cylinder, a pair of hollow pistons in said cylinder having open ends disposed toward the ends thereof, fixed abutments disposed in said pistons, resilient legs extending from said abutments and having their free ends sprung into sockets in the cylinder, means for admitting air into one piston as it receds from its abutment and for directing said air into the cylinder as said piston moves toward said abutment, whereby to scavenge the cylinder of burnt gases, means for admitting an explosive mixture into the other piston as it recedes from its abutment and for directing this mixture into the cylinder as said last named piston travels toward its abutment, and means connecting said pistons for causing them to move inwardly and outwardly in unison.



1,262,834. AEROPLANE. **Giovanni Norberti**, Boston, Mass. Filed July 3, 1917. Serial No. 178,352. (Cl. 244—21.)

6. A heavier-than-air machine having a body and laterally extended planes, a shallow receptacle spaced above said body, tubes uniting the ceiling of the body with the floor of the receptacle, a rounded plate beneath the ceiling of the said body and between the lower ends of said tubes, a parachute adapted to be packed into said receptacle, and ropes for suspending the machine from the parachute, the plate having diametrical grooves of different depths, and each rope passing from one point of the parachute down through one tube, through a groove in the plate, and up through another tube to a diametrically opposite point of the parachute.

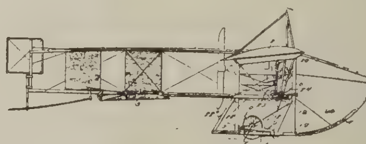


7. A heavier-than-air machine having a frame pivotally supported in a vertical plane at the nose of the machine, a netting stretched across the frame, a roller located at the upper end of the frame, a sheet of fabric attached to the roller and adapted to be wound thereon, means operative at will for dropping the frame to a nearly horizontal position, and means for unrolling said sheet to extend it beneath said frame and netting.

1,263,758. LANDING AND LAUNCHING SYSTEM FOR AEROPLANES. **Rudolph R. Grant**, Norfolk, Va. Filed October 6, 1913. Serial No. 793,583. (Cl. 244—2.)

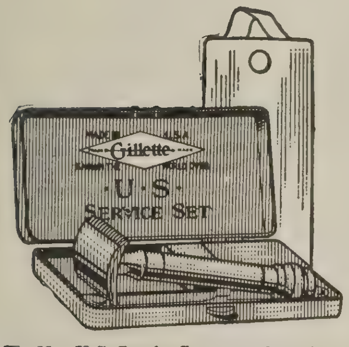
1. In a landing system for flying machines, the combination of skids, of a truck, links pivoted at one end to the skid and intermediately carrying the truck, a resilient connection between the other end of the links and the skids and stays attached to the truck and converging forwardly and attached to the skid system to form stops to aid in preventing slewing of the truck.

3. In an aeroplane, the combination with a supporting wheel of a band, means for normally holding the band in front of the wheel, means for bringing the band beneath the wheel and arresting it in that position with the wheel resting thereon, and means for permitting rearward movement of the band from that position.

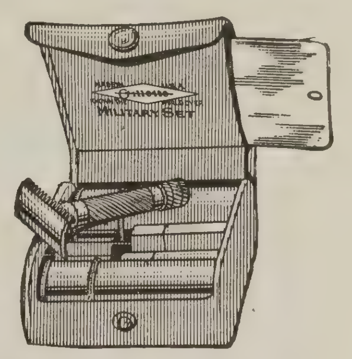


5. In a braking mechanism for a flying machine, the combination with supporting wheels, of a band, means for moving the band to a position beneath the wheels, and means for moving the band to a position in front of the wheels when said wheels are lifted.

Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

When you are overseas—you'll need a Gillette even more than you do here in camp

Trench life is harder. Shaving more difficult. A Soldier's skin is apt to be burned or chapped. Hot water seldom to be had. Four years of war have done more to prove Gillette *principles* and demonstrate Gillette *service* than fifty years of peace.

The principle of No Stropping, No Honing saves time. It saves space and weight. It does away with strop and hone—gives the fighting man his shaving kit in one compact unit. There is no shaving edge anywhere so good and *lasting* as the edge of the Gillette Blade.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

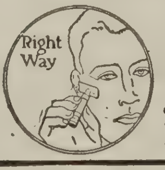
Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Here's the Way to Get 100% Efficiency Out of Your Gillette

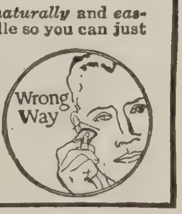
Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn*.



Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.



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Paris, France

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London, W., England

A. G. Micheles
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UNITED STATES AERO PROPELLER COMPANY
GENERAL OFFICES
BECHER AND GREENBUSH STREETS
MILWAUKEE - - - WISCONSIN

(*Continued from page* 1021)

H

Hess, Edwin	HHN
Hamilton, Edward	FRF
Howard, Charles W	DAP
Hefferman, Leo G.	KST
Harper, Harry M	TFT
Hartman, Harry B	CGC
Harvey, Frank A	TFT
Heath, Lawrence B	FRF
Hockett, Roland R	TFT
Harrison, Landreth M	TFT
Hollander, Robert B	TFT
Hart, William C	DIK
Hull, Justus M	DIK
Hunt, Victor A	FLR
Hamilton, Thomas Verne	OBS
Hangan, Alfred J	OBS
Hardesty, Francis Jackson	OBS
Harshaw, Myron Turner	OBS
Hastey, Thomas Watson	OBS
Hicks, Charles Carroll	OBS
Hill, John Parker	OBS; SMM
Hirsch, Morriss Weiss	OBS
Hoffman, Raymond L	OBS
Honhart, Harold Ernest	OBS
Howard, Thomas Duncan	OBS
Hermes, John P	DMA
Hill, G. Everett, Jr	ALF
Hance, George W	SRC
Harris, Allan B	FRF
Heeser, John W	BST
Halsey, Frank D	AAD
Hunt, David M	AAD
Herman, Ralph S	OBS
Horner, Thomas Elmer	OBS
Hebbard, Charles B	PFO
Heffley, Armor S	BST
Heston, Charles E	MJR
Huffman, George R	PFO
Henriques, Charles R	FRF
Hanson, Howell R	AIR
Horner, Thomas E	AIR
Hastorf, Albert H., Jr	CPR
Hoefgen, Leonard E	EOT
Holden, Harlan W	OBS
Hughmann, Henry C	SRC
Hugus, Z. Zimmerman	SRC
Hirshfield, Ira W	PFO
Hequemnourg, Theodore M	DMA
Himebaugh, Gero A	EOT
Holmberg, John B	SMM
Hager, Henry M	SMM
Haggerty, Lyman H	BST
Holborn, Clarence E	BST
Hall, Edwin P	EOT
Heng, John A	FRF
Harms, Henry W	AIR
Hamman, William P	GLC
Hooper, James C	GLC
Heffner, Paul	GLC
Howard, Robert B	WFO

I

Irwin, H. S	FRF

J

Jennings, George Alfred	OBS
Jones, James William	OBS
Jack, Butler, Jr	FRF
Jewett, Alfred L	BST
Jenkins, Benjamin L	CPR
Jenkins, Benjamin F	DIK
Johnson, Allison F	FRF
Johnson, Carl E	BST
Jones, Leland S	TFT
Jones, Frederick H	CAP
Jones, Byron Q	AIR
Jones, Edward K	AIR
Jones, Elmer H	PFO
Jenkins, James W	AIR
Joscelyn, Douglass L	RSD
Jaggard, Robert K	EOT

K

Klingensmith, Ward C	FRF
Kinder, Roland H	TFT
Kerr, Frederick M	ALF
Kelleher, Robert J	CPR
Kuehl, Adolph A	DIK
King, Lawrence S	DIK
Kalkman, Eugene C	OBS
Kauffman, Cyrus S	OBS
Kendrick, Aaron Tomlin, Jr	OBS
Kibbe, Gordon Mirro	OBS
Kimball, Milton S	OBS
King, Alfred Foster, Jr	OBS
Klinger, Kenneth Peffly	OBS
Knowlton, George Edgar, Jr	OBS
Krohn, William	FRF
Kane, Henry F. F	FRF
Kincaid, Alvin Cleveland	AAD
Klein, Pressly B	PFO
Knight, Emmett R	CMV
Kaas, Otto L	SMM
Kelly, John K	AIR
Kneeland, Lyle A	DIK
King, Charles Daly	OBS
King, William T., Jr	DIK
Katzman, Leo	FRF
Kent, Arthur O	FRF
Kline, John R	GLC
Kinney, Judson S	GLC

L

Lewis, Richard J	FRF
Lisenbee, George M	DMA
Littell, William B	SRC
Lambert, Gerard B	DMA
Lindsay, Gordon J	FRF
Lindsay, Oliver C	TFT
Lemley, Russell W	DIK
Lyle, Homer E	DIK
Lynch, James H	CAP
Laird, Homer Ulysses	OBS
Lippman, Frank Edward	OBS
Lokey, Walter Ruckman	OBS
Lisenbee, George	DMA
Lilley, Leonard E	DMA
Lassiter, Robert E	DAP
Lucas, Ottis P	AIR
Levin, H. D	FRF
Lees, Herbert G	EOT
Liles, Fred C	BST
Laubenfels, Clarence R	EOT
Logan, Leland	OBS
Lucas, Otis Perry	OBS
Lahm, Frank P	AIR
Lawton, Mortimer P	CMV
Lowry, William J	PMT
Longanecker	FRF
Lytle, Lowry R	DIK
Lutz, Ernest W	DIK
Landers, Lorenzo Stone	FLR; Note 10

M

Marsh, Gerald G	FRF
Mann, Alfred C	DIK
Maurice, Walter B	RWT
Meier, Milo S	FRF
Martin, Joseph H	DIK
Marriner, Alfred W	GLC
Morgan, Marion H., Jr	DIK
Miller, Samuel H	CPR
Mayer, Arthur C	TFT
Merkel, Louis J	ALF
Maxwell, Warren A	DIK
Miller, Raymond H	DIK
Mackie, Perle	AIR; SMM
Metcalf, Frank	AIR
Midcap, Clarence L	AIR
Murphy, Charles S	AIR; SMM
Minister, Harry T	EOT
Meany, Philip Joseph	OBS
Merrill, George Baker	OBS
Martin, David M., Jr	EOT
Moses, Lester E	EOT
Monteith, Percy Loba	OBS; SMM
Mooney, Herbert R	OBS
Murphy, Dan Walter	OBS
Mapes, Gordon W	FRF
Maxwell, Maurice F	EOT
Miller, Rolfe T	EOT
Mullins, Edward R	SLR; VBW
Mosher, Ralph H	PFO
Mayer, William	AIR
Morrow, Joseph C	AIR
Mess, Robert W	FRF

Maranville, Clarence H	AIR
Mitchell, William	AIR
Milling, Thomas DeW	AIR
Melhop, Thomas P	FRF
Mason, Richard A	SMM
Martin, Harold S	AIR
Morison, James C	EOT
Morris, Charles G	EOT
Manley, Henry S	BST
Masson, Charles A	BST
Marsh, Albert E	FRF
Mayer, Arthur C	TFT

M

Martin, Milton R	FRF
Morgan, William T., Jr	DIK
Modlish, Gus P	WFO
Moore, Harold A	GLC
Mayer, William Dorward	SLA; Note 7
Martin, Richard H	Note 4
Mack, George K	Note 14

Mc

MacDonald, Russell C	DIK
Maclaren, Clyde A	RWT
McArthur, John K	DIK; FRF
McCormack, Earl N	DIK
McConkey, Fred Wesley	OBS
McDonald, Hunter, Jr	OBS
McFarland, Frank Henry	OBS
McFarland, William Philip	OBS
McKey, Claude Dyson	OBS
McKinnon, John Alex	OBS
McKnight, Roy A	FRF
McGehee, Leo R	BST
McCullough, Charles B	DMA
McHenry, Arthur J	EOT
McCullough, Rodger S	CMV
McCoy, Dell H	SMM
McCally, Ross LaR	OBS
MacDill, Leslie	AIR
McGovern, John E	FRF
McDonell, John C	AIR
McDonald, James F	EOT
McCracken, Nelson	CDT
McDowell, Lloyd J	DIK
McClintock, Arnold R	DIK
McHenry, Harold I	Note 14

N

Nelson, Arlen C	TFT
Nelson, Sinius J	TFT
Norwood, George McIntosh	OBS
Night, William Joseph	OBS
Nolan, Thomas Joseph	OBS
Nicol, George L	VBW
Neely, John Howard	OBS
Norris, William Ruggles	OBS; SMM
Nugent, Daniel C., Jr	UTA
Neumuller, Donald J	AIR
Netherwood, Douglas B	AIR
Nolan, Philip E	DIK

O

O'Connell, Joseph H	KST
O'Neil, James H	SMM
O'Neil, John F	DIK
Orr, Dale	TFT
O'Brain, John J., Jr	CPR
Osborn, George M	DMA
Owen, Richard, Jr	PMT
Orvis, Warner D	FLR
Olston, Frank Michael	AAD
Osment, Horace	AAD
Olds, Harvey R	FRF
Ogden, James B	PFO
Otto, Charles D	PMT
Owen, James P	FRF

P

Place, Fred	CUI
Phillips, Michael J	DMA
Pierce, Hugh M	KST
Parmley, George W	DIK
Perry, Willis O	CPR
Pugh, Richard O	DIK
Pilkington, Fred W	DIK
Perry, Marney D	TFT
Parker, Walter A	CAP
Palmerlee, Joseph Burr	OBS
Pendell, Elmer	OBS
Penland, Clifford Henry	OBS
Perkins, John M	OBS
Phillips, Walter Paschall	OBS
Pope, John Blakely, Jr	OBS
Prindle, William Day	OBS
Pruter, Frederick	OBS
Perkins, Thomas P	CPR
Poladd, Thomas G	EOT
Patton, Hilton Millard	OBS
Perrin, Courtney Dale	MJR
Pots, John T	PMT
Pendleton, Littleton Flippo	AAD
Peabody, George H	AIR
Paine, Grosvenor R	EOT
Pogue, Davenport	PMT
Pilcher, Rufus J	PFO
Parker, Charles W	DIK
Pavey, Smith W	DIK
Pfeil, Paul F	DIK
Pierce, Leonard R	DIK
Phelps, Raymond W	DIK
Powers, Edward M	DIK
Phillimore, Walter N., Jr	DIK
Pearson, Oscar W	DIK
Peters, Oscar W	DIK
Peters, Crawford A	DIK
Payne, Franklin S	DIK

R

Richard, Fletcher D	FRF
Reddy, Philip J	CGC
Rice, George E	DIK
Rausch, Lorenzo A	DIK
Russell, Ralph C	TFT
Rivera, Reynaldo J	DIK
Rogers, Edward B	DIK
Reed, Homer, Jr	CAP
Readio, Roger F	DIK
Roche, Clifton R	FRF
Richards, Keene	MJR
Rozier, Thomas C	OBS
Regan, John A	FRF
Rothstein, Arthur	CAF
Reichardt, Chris	OBS
Richelieu, William V	OBS
Rogers, Embre Charles	OBS
Rust, Franklin Martin	OBS
Relf, Richard	PFO
Rheinstein, Alfred	SLR; DMA
Rader, Ira A	AIR
Reinburg, George E. A	AIR
Rice, Hubert M	SMM
Russell, Emerson G	EOT
Royce, Ralph	AIR
Ratliffe, George T	EOT
Ruddell, Noel Craig	AAD
Rue, Lars	EOT
Reed, John S	BST
Russell, Franklin B	PFO
Rosaire, Esme E	FRF
Ryniker, Milton E	EOT
Rombough, Miles D	BST
Roberts, Gerald I	EOT
Rice, Ralph W	FRF
Rich, Edward E	FRF
Richardson, Baxter K	FRF
Robertson, William B	FRF
Ray, Harvey T	FRF
Rundle, W. B	DIK
Reese, Lewis R. P	FRF
Richmond, Irl H	DIK
Rennebaum, Ernest H	DIK
Rechtsteiner, Victor M	GLC
Rowland, Dudley E	DIK
Ryder, Gerald A	DIK

S

Stevens, Roger B	SRC
Sykes, George E	DMA
Steel, John A	FRF
Shank, Harry E	DIK
Stauffer, John L	DIK
Sheppard, Harry S	MJR
Scott, John E	CPR
Smith, Howard E	DIK
Sherrick, Leon D	DIK
Spofford, Benjamin D	DIK
Starr, John Ford	SLT; VBW
Slentz, Floyd G	VBW
Stees, Donald B	CRI
Sargent, William H	AIR
Scott, Robert C	AIR
Stewart, Robert H	AIR
Saltsman, Irl Leonard	OBS
Steele, James Jesse	OBS
Stephenson, George Brown	OBS
Search, Henrick Monroe	OBS
Shedden, George Alden	OBS
Signer, John William	OBS
Sinnigen, Julius Clarence	OBS
Southall, Hubert Roland	OBS
Stewart, Robert Henry	OBS
Sapiro, Milton D	CMV
Sammon, William B	CMV
Smith, Fred Hardin	EOT
Smith, Edward T	DMA
Shaw, Phillips B	VBW
Shields, George H., Jr	DMA
Schmidt, Henry D	FLR
Stinson, David R	FRF
Sullivan, Daniel J., Jr	CAF
Stackpole, Frank C	CAF
Simmons, Frank H	SMM
Schreyer, Malcolm E	SMM
Schuemacher, Clyde J	FRF
Slade, Russell C	SLR; VBW
Smith, Melville D	PMT
Stevenson, Frederic F	PMT
Simpson, John M	RSD
Spatz, Carl	AIR
Senft, Walter M	EOT
Sampson, F. B	FRF
Surteaux, John LeV	DIK
Scull, Leo N	FRF
Swan, Walter S	FRF
Sheehy, John F	EOT
Skoning, John H	BST
Simrall, William F	EOT
Santos, Alexander H	FRF
Seward, Jackson A	FRF
Shea, Thomas F	FRF
Smith, Frank H	FRF
Stanley, Robert	FRF
Stewart, Guy	FRF
Searle, Platt F	FRF
Snyder, Lewis C	CDT
Stewart, James D	FRF
Scoby, Hal. A	DIK
Stinchcomb, Orville C	DIK
Smith, Herbert C	DIK
Stenhouse, Lester U	DIK
Stapleton, Charles E	DIK
Spicer, Orville W	DIK
Smith, William	Note 2
Stein, Philip	SLA; Note 10

T

Tips, Eugene C.	FRF
Thayer, Raymond H.	TFT
Tilney, John Mason	DAP
Tompkins, Frederick	DIK
Thigpen, Roy M.	TFT
Tinnerholm, Ivar E.	TFT
Tufts, Russell D.	DIK
Turner, Earle O.	VBW
Tailer, James B.	UIU
Temple, Paul N.	PFO
Taylor, Harold L.	EOT
Tinnerholm, Robert F.	EOT
Taylor, Benjamin H.	CAF
Thomas, Herbert F.	AIR
Tierney, John W.	EOT
Tyler, Lee	OBS
Thompson, Arthur Stanley	OBS
Taylor, Bayard C.	FRF
Thomson, William W.	FRF
Turner, George Frear	SLA; DAP
Taylor, Dorr K.	DMA
Towle, Ellingwood H.	DIK
Trinler, Newland D.	DIK
Taylor, Elmer L.	DIK

U

Ucker, Henry C., Jr.	WAC
Underwood, Claude S.	AIR

V

Volk, Charles F.	TFT
Vincent, Osmer H.	DIK
Van Horsen, John M.	CGC
Van Vliet, Fred S.	DIK
Vincent, John Henry	OBS
Viljoen, Wynand	FLP
Vollmer, Edward C.	RSD
Van Arsdale, Maurice W.	FRF
Vaughn, Guy O.	FRF
Van Hake, Richard A	DIK
Van Auken, Wendell G.	DIK
Verkouteren, John H.	GLC

W

Worthington, John A.	TMA
White, John K.	DIS
White, Frank E.	DIK
West, Norman S.	TFT
Weddington, Leonard D.	DIK
Wilbur, Fred V.	TFT
Wiswall, George H.	DIK
Walker, Harry W.	DIK
Windsor, Thomas H.	DIK
Wagner, Emil Theodore	OBS
Watson, Osborne Stone	OBS
Watterworth, Earle J.	OBS
White, Kenneth Taylor	OBS
Williams, Raymond Branwell	OBS
Winants, Garrett Ellis	OBS
Wray, James Henry	OBS
Wyman, Tupper	OBS
Warner, Sam B.	DMA
Wiehe, Trude A.	VBW
Woolley, Frederick P.	FRF
Williamson, James Chapman	PMT
Williams, Richard E.	FRF
Willis, Robert H., Jr.	AIR
Wertimer, Sidney	OBS
White, Morris Gardner, Jr.	OBS
Wilson, Guy H.	OBS
Woods, Ray James	OBS
Wood, Harold E.	FLR
Weeden, Charles F., Jr.	FRF
Wallace, Charles S.	CSO
Wallis, James Christopher	SMM
Wolaver, Charles Nicholas	SMM
Wyman, Philip	CPR
White, Morris G.	AIR
Watkins, Dudley W.	RSD
Watson, Hugh	BST
Williams, Edward L.	HHN
Willingham, Harris E.	CWT
Wilcox, James W.	FRF
Wilder, Morris B	CDT
Wierman, Paul D.	DIK
Wurster, William F.	DIK
Wheless, William M.	DIK
Wells, Harold R.	PMT
Wards, Wilfred B.	BST
Wimer, Frank B.	DIK
Wright, Harry J.	FRF
White, Sanford B.	Note 18
Wallace, Melvin	Note 6
Wall, C. E.	Note 14
Williams, Edward L., Jr.	Note 16

Y

Yerby, Walter T.	DIK
Yeomans, William Edward	OBS
Young, Bentley	OBS

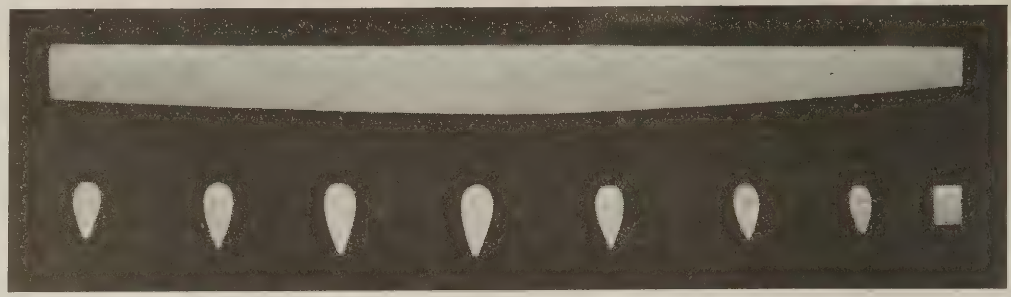
Z

Zanetti, Silvio	FRF

New Aero Mail Record

A new record in aero mail flights was set by Lieutenant Stephen Bonsal on July 29th, when he flew ninety miles from Bustleton Station, Philadeliphia, to Belmont Park in forty minutes. Up till then the record was forty-five minutes, made by Lieutenant C. P. Culver.

Lieutenant Bonsal left Belmont Park for Philadelphia at noon with 200 pounds of mail, the wind being against him, and arrived at Bustleton Station at 1:20 P. M. Leaving there at 1:30 with 175 pounds of mail, he returned to Belmont Park at 2:15.



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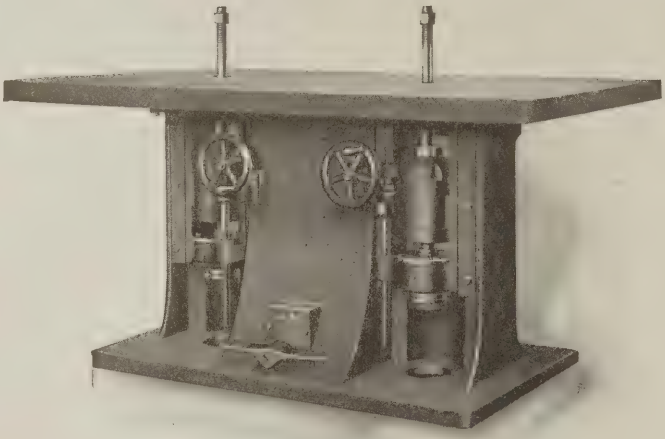

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30 Army Aviators Fly in Battle Manoeuvres

Mineola, L. I.—Between twenty and thirty army aeroplanes took part in an aerial battle early on July 26, flying over villages within twenty miles of the army aviation field here. At times the fog was so thick that the planes were obscured from view of observers on the ground, but the continuous humming of the motors was heard distinctly.

Major Rhinehardt, in command of the field here, anxious to ascertain the progress made by the airmen in training, planned the battle. Selecting skillful aviators and some of the fastest planes, he sent them away at sunrise. Part of the "battle" took place over the waters of Great South Bay, with some of the planes at a height of 2,000 feet. The airmen were instructed to make notations of the appearance of the bay from that height and to keep a lookout for "enemy submarines."

In the vicinity of Roslyn the fiercest battle occurred. A large American-built Caproni plane was pursued by four scout planes and was having a difficult time in keeping out of the way of the "machine gunners" aboard these speedy machines, when two large De Haviland planes engaged the smaller planes. Some of the machines flew as far as Bayshore, either in pursuit of others or trying to "escape." Referees on the aviation field, with powerful field glasses, watched the battle. It was planned that the triplane of the Curtiss type which is being tried out at the field should participate, but it did not leave the hangar. This machine, according to report, can rise faster than any plane built in this country.

Night Photos from Aeroplane

An Italian invention which permits photographs being taken at night has been submitted to the signal corps of the United States army.

According to the man who controls the new device, it will soon be possible to take excellent pictures of enemy positions from aeroplanes flying at a low height on moonlight nights. It is also claimed that the invention can be fitted to moving picture cameras, which would permit the photographing for the screen the actual fighting, much of which takes place in the early morning hours.

Up to the present time one of the chief obstacles met by the daylight aerial photographers was the anti-aircraft guns, which forced the fliers to take pictures from a great height, and much of the detail of the enemy lines was lost. It is held that fliers are in little danger from artillery when flying at night.—*Washington Post,* July 26, 1918.

Investigation of Seaplane Attack Made by Naval Officers

Washington.—Naval ordnance officers have been sent to Chatham, Mass., to investigate the failure to explode of bombs dropped by naval aviators on the German submarine off the Cape Cod coast Sunday.

Meanwhile, twenty-five similar bombs have been tested at another point, most of them exploding These bombs were dropped from seaplanes in the ordinary way. Another lot of bombs were dropped with some misses.

This announcement was made by Secretary of the Navy Daniels: "Of course, there is an element of safety to the aviators which must be taken into consideration," said Mr. Daniels, "but I have told Admiral Earle that all our aerial bombs should go off, even if we must run some risks."

Secretary Daniels said that the same type of bomb has given excellent results when used in the European war zone. Some have failed to explode, but the proportion has been small.

Further experiments are being made with aerial bombs, with a view to increasing the certainty of exploding when dropped. Had the bombs dropped in the vicinity of the U boat Sunday exploded many believe the vessel would have been destroyed. It is known, however, that at least one bomb was dropped so far away that it could not have damaged the submarine if it had exploded.

Mr. Daniels, in reply to questions, said it was possible that the bombs dropped near Chatham, Mass., failed to explode because of improper handling, which sometimes occurs.

When his attention was called to a story published this morning to the effect the student aviators dropped sandbags on the U boat, because they had nothing else to drop, Secretary Daniels smiled.

"We know bombs were dropped," he said, "and were astounded to learn that they had failed to explode."

New Combat Plane Ordered for U. S.

Washington.—A new type of combat plane, resembling the British Spad, is to be manufactured in the United States for use in France. This decision has been reached following failure to make a success of the Bristol fighter equipped with the Liberty motor, it was learned.

The decision to manufacture the new fighter, known as the "S. E. 5," marks another change in policy. The bad fall down in the attempt to make the light, fast Bristol fighter, designed for a 180 Hispana-Suiza motor, carry a Liberty motor of 400 horse-power, was followed by a decision to confine American manufacture of aeroplanes to training and heavy bombing machines. This has been modified, and the "S. E. 5" combat plane will be turned out at the Curtiss plant, Buffalo.

The new type of fighter is to be equipped with the Hispana-Suiza motor. There will be no experimenting with it. The Bristol was so overloaded with engine that the wing load was increased from the safe figure of 7.1 pounds per square foot to 9.2 pounds. This increase in wing load with the terrific speed of the fast fighter made it absolutely unsafe. The death of many American aviators in this country is charged against this fact. Two hundred Bristol machines built at the Curtiss plant will be scrapped.

Manufacture of a new De Haviland type of bombing plane, the "9," to replace the manufacture of the "4" has been decided upon also. Aviators have said that the type "9" is a great improvement over the "4."

The new type is not a radical departure from the "4" but an improvement on it. Orders have been issued to speed up construction of the De Haviland "4s" now being built and then turn attention to the "9."

The Government is about to enter into contracts for 60,000 additional Liberty motors. The failure of the Bristol fighter to make a success equipped with the heavy engine is not a criticism of the motor, it was pointed out to-day.

It has been decided to equip all American-made tanks with the Liberty motor. It has been tested for this and found acceptable.

Increase of Capital Stock

The Standard Aircraft Corporation announces an increase in capitalization from $5,000,000 to $10,000,000, divided in $7,000,000 preferred, and $3,000,000 common stock (par $100), all subscribed and taken. This has become absolutely necessary, in order to take care of the enormously increased production of the organization, which, although but two years old, is now a predominant national figure in aircraft production. Of the preferred stock, $1,000,000 will, for the present, be retained in the company's treasury. The officers of the company are: Harry Bowers Mingle, President; Edward E. Pennewill, Vice President and General Manager; Max J. Finkelstein, Vice President and Treasurer; Charles H. Day, Vice President and Consulting Engineer.

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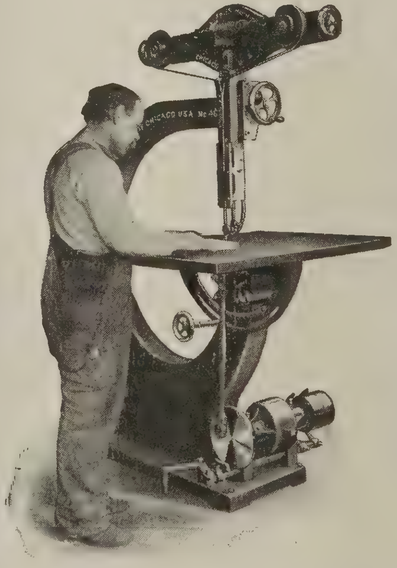

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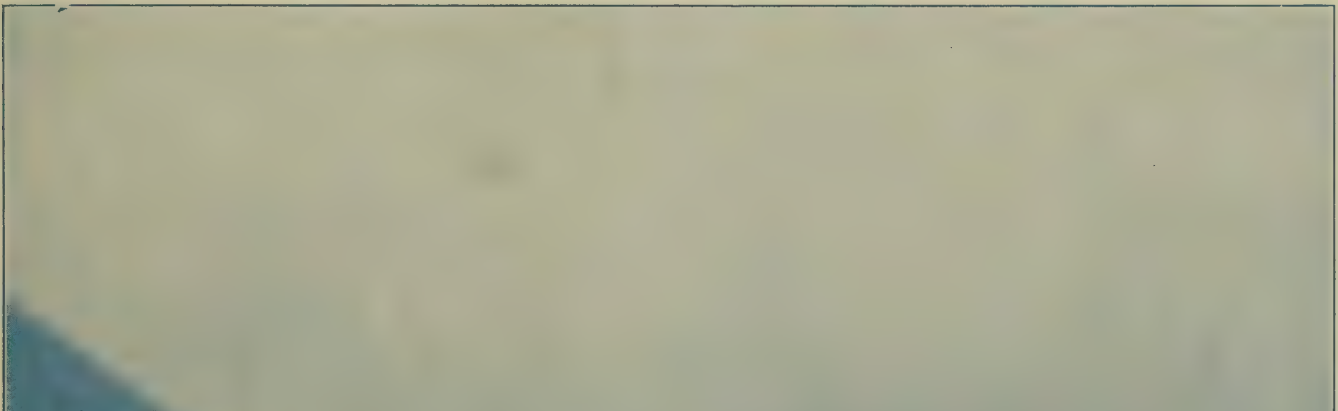
WEEKLY

Vol. 7, No. 22 AUGUST 12, 1918 10 CENTS A COPY



An Allied battleplane engaged in patrol work, flying over a bank of clouds

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Cleveland and Chicago to Ask for Aerial Mail Line

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CLEVELAND AND CHICAGO TO ASK FOR AERIAL MAIL LINE

THE remarkable performances of the Aerial Mail Service during the past two months having shown that the Aerial Mail Service can be run on schedule time rain or shine, efforts are being made to arrange for the extension of the service to other cities.

Cleveland and Chicago are being urged to ask for aerial mail lines and to establish aerodromes to facilitate the work of establishing the Aerial Mail Service.

In letters sent to Colonel Myron T. Herrick, Chairman of the Chamber of Commerce of Cleveland, and to the Secretary of the Chicago Chamber of Commerce, and about fifty prominent people in Cleveland and Chicago, Mr. Henry Woodhouse the Vice-President of the Aerial League of America, wrote as follows:

"My dear Col. Herrick:

"It is not often a city gets an opportunity to get millions of dollars worth of publicity, as well as go down in history as having been a pioneer in an important work—which means getting more millions of dollars worth of advertising in future—by pointing to the fact that said city was a pioneer.

"Cleveland has today a wonderful opportunity of getting millions of dollars worth of national advertising and can become a pioneer by doing something which hereafter Cleveland people will point to as an example of the progressiveness of Cleveland.

"Today Cleveland can have mail delivered by aeroplane provided you ask for it, and we are ready to help you ask for it, and help you get it.

"Up to now the Army has conducted flights between Washington and New York, and these flights, piloted by Army fliers, were looked upon purely as an experimental proposition. It did not require many months to convince the postal authorities that whereas it was demonstrated that fliers could weather all sorts of storms, leave on schedule time and arrive with mail in the shortest possible time known, the aerial mail service is an asset. They immediately made a proposition to take over the entire service, and which, from good information now at hand, is about to take place before the middle of the month.

"Mr. Otto Praeger, Second Assistant Postmaster General, and Capt. Benjamin B. Lipsner, who is Superintendent in Charge of the Division of Aerial Mail Service of the Post Office Department, both remarkable men with extensive vision and tremendous energy, are making plans for the extension of the aerial mail service.

"Now is the time for Cleveland to ask them to include Cleveland in their plans, and as they are anxious to increase the efficiency of mail delivery, and the aeroplane will enable the Post Office to cut down the time of delivery of mail to Cleveland from other cities by many hours, I feel sure that if the Chamber of Commerce asks for an aero mail service, Cleveland will get it and will get it mighty soon.

"Two months of aerial mail service has shown that the men in charge are men who do things quickly and effectively. Provided they see a need for an aerial mail route and they get an offer of co-operation from the Chamber of Commerce, you can rest assured that aeroplanes will be flying to Cleveland a very short time thereafter.

"It is hardly necessary for me to point out that now that we have aeroplanes capable of lifting fifteen tons and going at a speed of about 100 miles per hour, and the Air Service comprises over 10,000 aviators, and the non-flying personnel numbers over 100,000 men, the general application of aircraft for transportation is to come fast.

"Only a few days ago a despatch quoted Mr. John D. Ryan, the energetic Director of Aircraft Production, as saying that there is a type of aeroplane under construction which is to be equipped with four Liberty motors, or 1750 horse power. This air cruiser will probably be capable of lifting close to 40,000 pounds, and the limit in size has by no means been reached. A 5,000 horse power aeroplane may cleave the air before we are a year older.

"Likewise delivery of mail across the Atlantic and across the continent may be as common next year at this time as the delivery of mail by aeroplane on the New York-Philadelphia-Washington route is today. This mail will be much heavier over long distances, because then the aeroplane will make it possible to make deliveries a number of days sooner.

"The fact that the radius of flight of aeroplanes is extending to 2,000 miles, and may extend to 4,000 miles within two years, brings hope for closer understanding between nations after the war, due to faster transportation and intercommunication, but also brings the menace of disaster which may befall to our generation if the control of the air should be gained by a country like Germany.

"As a matter of fact, it is known that Germany is planning extensive aerial mail, express, and passenger transportation lines, to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of large aircraft. This would give her a reserve air fleet large enough to blow England, France or Italy off the map overnight. As was brought out in the House of Commons, by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. A nation that overlooks this fact may pay dearly for its oversight.

"We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids on Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, we must be ready to protect the Republic, and the rights of Humanity and the Cause of Civilization.

"We must, of course, think with both our hearts and our minds when contemplating the reconstruction that will follow the war. We will need both.

"Anything that is done to bring into use thousands of aircraft for civic purposes is a contribution towards placing the United States in the position of the porcupine which goes about its peaceful pursuits, harms no one, but is ever ready to defend itself. The Post Office can use thousands of aeroplanes for the aerial mail service—which will form a valuable reserve for national defense. In assisting the development of the aerial mail service you will be assisting the development of aerial reserves as well.

"You will want to know what are the steps the Chamber of Commerce should take to secure this mail service, so I will define these steps briefly as follows:

"(1) Call a meeting of the Chamber of Commerce, or of your Executive Committee and pass a resolution submitting to the Postal authorities that Cleveland is entitled to aerial mail service, and that Cleveland should be included in the plan for extension of aerial mails.

"(2) Appoint a committee of twenty of your best and most energetic members to consider selecting a place near to the city, or in the city, if possible, suitable for an aerial station. The place ought to be about 1,000 yards square, although it does not matter what shape it is, so long as you have approximately the landing space available in 1,000 square yards. In this respect, I may point out that aerodromes are very much like streets. If you start out by having a narrow street you find later that you have to widen it, and it is difficult to do so. If you start out by making the aerodrome wide enough, you save yourself and the coming generation a great deal of trouble. If a good size aerodrome is selected, then a great many more air lines will be establishd from other cities to Cleveland, because aviators are very much like captains of ships—they prefer to go to ports which afford the best docking facilities. As a matter of fact, the aviator is very much more independent than the captain of a ship, because it only takes a few minutes for him to go to another place thirty or fifty miles away. Therefore, if you want him to come to Cleveland you will have to supply a good aerodrome with suitable facilities to begin with.

"(3) Wthin a few days I will send you a sketch showing what an aerodrome should be in a general way, to facilitate the work of your committee. But I feel sure that as soon as the Chamber of Commerc passes a resolution asking the Post Office to include Cleveland in the aero mail service as a station, you will have the energetic Capt. Lipsner in Cleveland to see what can be done and help your committee to select the field.

"Aerial mail will make it possible to cut down the number of hours in the delivery of mail to every other city in every direction, even though the other cities may not be connected with Cleveland by aerial mail, because the aeroplane will make faster train connections. This will mean a saving of a great many hours or days in the transmission of mail. People in New York and Washington have found that aerial mail permits of saving one or two days in correspondence. For instance, if we receive a letter from Washington in the morning mail, we can answer it and send it to Washington by aeroplane, mailing it at 11 o'clock. It gets there before 3 o'clock in the afternoon, which is early enough to permit them to answer our letter that day.

"In the case of manufacturers of war materials this means that if they receive a request from Washington for anything in the morning mail, they can send it to Washington in the aerial mail that morning and Washingto gets it early eough in the afternoon to send whatever specifications or contracts may be necessary. In other words, two days are saved by the use of the aerial mail, and in cases of war business, the production can actually begin two days earlier because of the aerial mail.

"Cleveland being a manufacturing center, the aerial mail from New York westward would permit saving a great many days in starting the production of war orders.

"The Cleveland newspapers can be counted upon to support the Chamber of Commerce in this request to the Post Office, and, of course you can publish this letter if you think it will assist in creating interest in Cleveland.

"As Postmaster Praeger and Capt. Lipsner are now working on plans, I would urge speedy action so that your request will come before the plans are completed.

"Needless to say, the Aero Club of America and Aerial League of America, and the magazines "Flying" (monthly) and "Aerial Age" (weekly), which have done the pioneer work in fostering the development of the Aerial Mail Service, will be greatly pleased to co-operate with you and the Chamber of Commerce and the people and newspapers of Cleveland in bringing about this development. Please do not hesitate to call upon us whenever we can be of service.

With best wishes, I remain,

Yours very cordially,
(Signed) HENRY WOODHOUSE,
Vice President, Aerial League of America.

This letter was also sent to the Cleveland newspapers and to the following prominent Cleveland people:

Judge W. B. Sanders, Matthew Andrews, C. C. Bolt, B. F. Bourne, F. C. Case, Alvah Chisholm, J. Crider, N. L. Dauby, H. P. Eels, F. Allen Whitting, Elton Hoyt, Julius Feiss, Richard F. Grant, George W. Kinney, Glen L. Martin, Samuel Mather, W. G. Mather, Wm. P. Palmer, S. L. Pierce, E. F. Prentiss, E. W. Bingham, Parmeley Herrick.

SENATORS PROPOSE AIR MINISTRY

SENATORS JAMES A. REED and Harry S. New, of the Senate Committee on Aircraft propose to carry out General Brancker's advice to create an air ministry in the United States as soon as possible.

General William S. Brancker, the Controller General of Equipment for the British Air Ministry, in a statement to the Associated Press before his departure from the United States said:

"It is within the realm of certainty that we can bomb Berlin in the spring, if not in the fall, with aeroplanes we are building, as we have already bombed Cologne and the Rhine cities, but we have not the numbers for a really big offensive in my understanding of the term.

"We have plenty of planes and can build plenty more, but we lack engines and we have about reached the limit of capacity for engine production.

"We have built up a big aeroplane programme to use the Liberty motor and bomb Germany, but America cannot now spare these motors, and so I fear that our aeroplanes will be wasted, and the real offensive from the air will be seriously delayed.

"The delivery of certain types of planes by flying them across the Atlantic is feasible. If we can fly to Berlin and back, which is more than 800 miles, we can fly from Newfoundland to the Azores, the longest gap of the journey, 1,200 miles. This means a big organization, aerodromes and repair plants in Newfoundland and the Azores.

"Your air forces ought to be organized on a tremendous scale, and this is what we look to America to do."

General Brancker urged that the United States Government create a Cabinet position of air controller, who would conduct the department entirely separate from that of the Army and Navy. England has found this necessary.

The Allies now have the ascendency in the air, but they are handicapped by lack of suitable planes that could operate for longer flights over Germany.

He continued:

"We simply had to come to an Air Ministry in England. The Zeppelins and the Gothas, coupled with the experience gained when aviation was controlled by the army and navy, forced it upon us. Public sentiment demanded it.

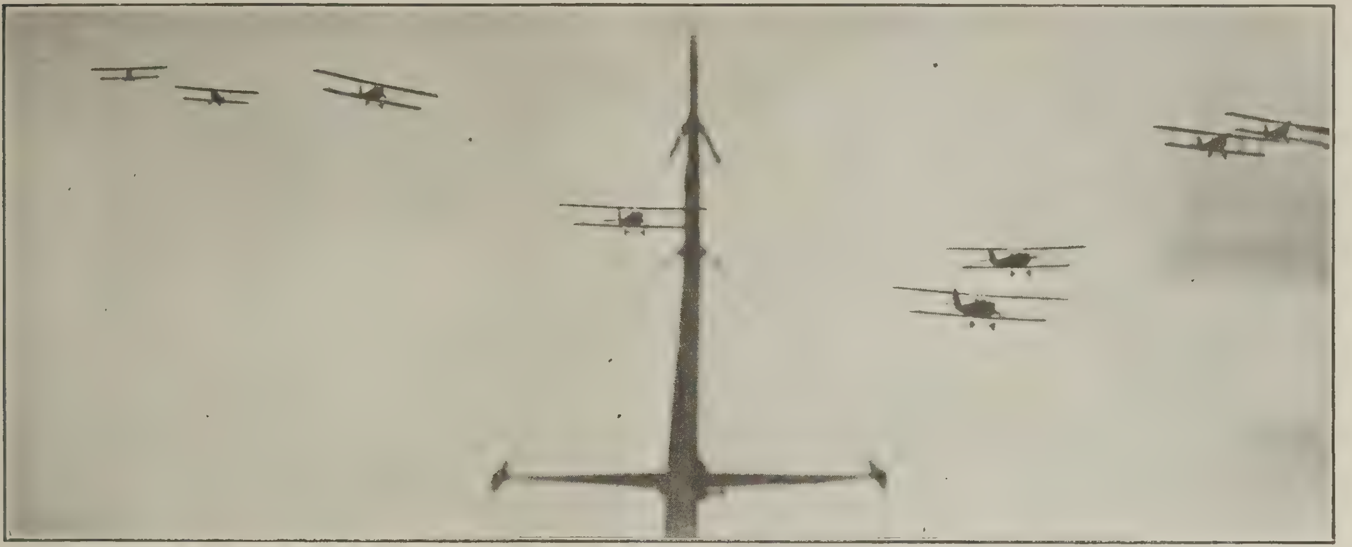
"You have had no air raids in this country to arouse you, but it is my hope that, lacking this stimulus, you will profit by our experience and begin at once on an even basis with us in this matter, instead of waiting for public sentiment to push up from the bottom as in our case.

"Are not the advantages of independent control obvious? Here you have one branch of aviation under the administration of the Secretary of War, another under the Secretary of the Navy. These administrators have many other affairs to attend to. They have subordinates in charge, and there is an Aircraft Production Board, but it is obvious that certain general problems must come before the Secretaries for decision which an official would be much better able to pass upon if aviation were the exclusive function of his office.

"You see we are quite independent. We can formulate policy and strategy, while production, equipment and personnel function under one control. We do not have the anomalous situation of one branch of aviation service competing with the other for production and equipment. Such coordination as this obviously is the only way a great air offensive can be prepared and conducted."

On July 31 Senator Reed came out strongly for the Air Ministry.

On August 1st a definite step looking to the creation of an Air Ministry was taken by Senator Harry S. New, of Indiana, who introduced a bill in the Senate providing for



A flight of American aeroplanes practising formation flying.

such a place in the Cabinet. Under his bill, all aircraft activity of both the army and navy would be placed under one central head, a Secretary of Aeronautics.

The title of the bill is explanatory and reads:

"A bill to create an Executive Department in the Government to be known as the Department of Aeronautics, and for the appointment of a Secretary of Aeronautics and an Assistant Secretary; providing for appropriations for the said department."

The text of the bill follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

"Sec. 1.—That there is hereby created for the period of the present war and for one year thereafter an executive department in the Government of the United States to be known as the Department of Aeronautics, the head of which shall be designated the Secretary of Aeronautics, who shall be appointed by the President and confirmed by the Senate. He shall be a member of the Cabinet and shall receive a salary of $12,000 per year. The Secretary of Aeronautics shall have direct and complete control of all matters pertaining to the designing, purchase, and manufacture and production of aircraft and aircraft equipment intended for the use of the army, the navy, and the Marine Corps of the United States.

"Sec. 2.—The department shall also have an assistant Secretary, who shall be appointed by the President and confirmed by the Senate, who shall receive a salary of $5,000 a year; and such other officers and employes as may be found necessary for the proper and efficient transaction of the business of the department.

"Sec. 3.—The unexpended balance of such appropriations as may have hitherto been made for the purchase and manufacture of aircraft and aircraft equipment and all appropriations which may hereafter be made for such purpose shall be available for the purpose of the department."

Senator New has for some time had the idea of a Secretary of Aeronautics in mind. His intention has been strengthened since the Military Committee's aviation subcommittee has been conducting its investigations.

"I am satisfied," he said today in an interview, "that this bill is the best solution of the aeroplane difficulties. It is based upon conclusions which I have reached as a result of three months of careful investigation of the aircraft situation.

"It is in accord with the opinion expressed by practically all the officers we have examined, as well as of present and former officials of the aircraft managements. Newspapers throughout the country, notably The New York *Times*, have advocated this step, and many public men as well as the experts believe in the plan.

"I do not claim to have originated this idea. England had to come to it long ago. I do not believe that it will ever be possible to bring about the high efficiency necessary to the production of the great number of aeroplanes we need to win the war as long as there is divided authority. There is no getting away from the fact that there is still divided authority in the handling of our aircraft program.

"I have become convinced that it is almost impossible to co-ordinate perfectly two great departments. No matter how hard they may seek to work in harmony, divided authority is always present and must necessarily manifest itself.

"There is only one solution, and that is to have some powerful central authority that would take care of the entire program. Our air battles will be one of the huge factors in the war, and everything must be done to give us the finest, fastest, and best flying machines in the world."

Senator New's bill met with sympathy among several of the twenty or more Senators present, upon this, one of the two days each week when the Senate meets. Senator Sheppard of Texas last year introduced a bill for central control of aircraft production, and he is expected to stand loyally behind the present measure.

AIR DREADNOUGHTS WILL CARRY 100 MEN ON BOMBING OFFENSIVES, CAPRONI SAYS

PARIS, July 29.—"Aeroplanes carrying 100 men and equipment with engines equal in power to those in a medium-sized steamship will be developed within three years," said Gianni Caproni, inventor of the Caproni bombing plane, in an interview today.

"The bombing planes now in use," Signor Caproni continued, "will be mere dwarfs compared with those to be developed. There is a surprise in store for the Germans. Instead of forty and fifty machines necessary to start on a bombing expedition, it will be possible to do the same work with a new machine as powerful as the whole squadron. The new machines will be much more efficacious and will prove a great saving in operation.

"A trip across the Atlantic could be accomplished with the present-day machines during July, August, and September, and probably October. The weather situation would be unfavorable during the other months of the year. Heavy fogs make aerial navigation impossible. Aviators are unable to guide themselves in a fog, as it makes everything black. A trip across the ocean at this time would have to be made by way of New York, the Azores, and Portugal.

"The development of an aerial code similar to the maritime code will be necessary before there can be general aerial navigation. There must be international signals, like those at sea, aerial laws and a whole volume of regulations for aerial transportation.

"The quick development of larger machines is inevitable. At the beginning of the war the largest bombing machine was of 100 horsepower. Now the largest bomber is of 1,000 horsepower.

"The Liberty motor will do. We want them now in large

(*Continued on page* 1083)

THE NEWS OF THE WEEK

Asks Cabinet Seat for Aircraft Head

Washington.—The fight for a Department of Aeronautics was started in the Senate on August 1st when Senator New, Republican, of Indiana, introduced a bill to that end.

The measure provides for an executive department with a Secretary of Aeronautics, to continue for one year after the end of the war, to have "direct and complete control of all matters pertaining to the designing, purchase, manufacture and production of aircraft and aircraft equipment intended for the use of the Army, the Navy and the Marine Corps of the United States." The pay of the Secretary of Aeronautics would be $12,000, and an Assistant Secretary at $5,000 is provided for.

The Senate Aircraft Investigating Committee to-day heard Major Rhinehart, Capt. J. M. Kelly, Capt. C. A. Johnson and Lieut. Frank Wells on the De Haviland and other planes. They were asked about their experience at Dayton, O., and in France. The testimony was given in executive session.

Bristol Aeroplane Scheme Dropped

Washington.—The Bristol aeroplane powered with the Liberty motor is not satisfactory and the building of the combination is about to be abandoned, it has been learned from a trustworthy source.

Until a few days ago army officers had great confidence in the possibilities of this English plane equipped with the Liberty motor. Its distinctive merit was to be great speed and it was to be used for fighting. Preliminary tests were highly encouraging. But in the past two or three weeks three men have been killed in tests and one dangerously injured. The last accident was at Buffalo, when the machine failed at a high altitude and crashed to the earth.

Plans Made on Large Scale

Careful investigation points unmistakably to the fact that the engine was too heavy for the plane, greatly increasing the load and the danger. The inquiries, it is said, have demonstrated that it would be unwise to go ahead with the plans, which had been made on a large scale.

Manufacturing plants have been preparing to go ahead with the building programme immediately. They recently had been put in shape for quantity production. One plant was prepared to turn out the machine in record breaking fashion.

The Government had contracted with the Curtiss Company of Buffalo, it is said, for 3,000 of these machines.

The decision to use the Bristol came after the failure to manufacture the Spad machine. The change, as testified by Major Gen. Squier, Chief Signal Officer, before the House Appropriation Committee April 5, 1918, required forty-five days. Col. Deeds testified that the Bristol could be manufactured easier than the single seated Spad. Full drawing and plans for building the Spad, he said, had been made when orders came from the other side to build the double seaters.

Bigger, More Gun Power

The new machine was to be bigger, with larger equipment and employing greater gun power.

While abandonment of the Bristol programme is a cause of regret, other fighting machines are being made in this country.

The Bristol machine has been tested frequently by the most experienced flyers and is capable, it is said, of developing a speed of 135 miles an hour. The great weight of the engine is too much for the plane construction, and, it is said, the plans will have to be materially readjusted before absolute success is attained.

Mineola-Washington Flight

Under orders to report to headquarters, Division of Military Aeronautics, Washington, Maj. C. K. Rhinehardt, commanding first provisional wing at Mineola, Long Island, made the flight from that field to this city July 31 in two hours and fifteen minutes, the War Department announced.

With him in the plane was Capt. Fred Harvey. The officers alternated in piloting. They left Mineola at 8:35 o'clock and landed at Philadelphia at 9:20. They left Philadelphia at 10 o'clock and reached Washington at 11:30. This is regarded as excellent time considering the rain and mist through which they flew most of the way. In their favor, however, was a northeast wind which stayed with them practically the entire distance.

Call for Men to Help Compile Pictorial History of the War

The War Department authorizes the following statement from the Signal Corps:

The Signal Corps announces an urgent need for a large number of men to engage in the compilation of a pictorial history of the war. About 60 more lieutenants and as many sergeants, first class, are to be selected for this work, and for a short time, until the immediate needs are met, some commissions will be given to men direct from civil life whose erperience is ample to justify this procedure. Other men will be sent temporarily to the Signal Corps School of Photography at Columbia University, New York City, where they will be taught not how to take pictures, but rather what kind of pictures to take. Many of the men commissioned will become staff officers of army divisions, and as such will be in charge of the work of making a pictorial history of the activities of that division from the time of organization through active participation in the conflict.

The successful newspaper photographer represents most nearly the type of man needed—that is to say, he must have a "nose for news" in addition to being able properly to set and expose his camera. A military photographer must possess a generous amount of initiative and originality, for he will have to act as his own boss, his own director, and dig up the type of picture that really tells the story.

The Signal Corps states that appointment will depend almost entirely on the man's previous experience. Application for service can be made and full particulars obtained by addressing the office of the Chief Signal Officer, Photographic Section, Arcade Building, Washington, D. C.

U. S. Aeroplane Carries a Motorcycle

Here's the latest efficiency feature in aircraft production. A motorcycle is standard equipment on this reconnaissance machine; its object being for use where a landing is made on the outskirts of a city or in the country. Heretofore the aviator had either to telephone for help or trust that a passing automobile would take him into a town or station. This idea was originated by Glenn Martin, aviator and aeroplane builder for the United States Government.

Aviators Fly from Paris to St. Nazaire and Back

Paris.—Two aviators are reported to have made a flight from Paris to St. Nazaire and return in five hours and fifty minutes. This time included a stop of three-quarters of an hour at St. Nazaire. The distance during the round trip was about 475 miles.

Our Captured Fliers Well

GENEVA, Switzerland. — Communications have been received here by the Red Cross from ten American aviators who were taken prisoner during recent aerial raids by American squadrons on towns along the Rhine River. All the aviators are in excellent health. They have been interned at Baden and Rastatt. The names of the pilots and the details of their capture have been forwarded to Washington.

Aviation cadets on their last route march before graduating from the school which they were attending. Each squadron adopts an insignia. This insignia is seen on their regimental color shown alongside the national colors. (Committee on Public Information)

Rantoul and Chanute Field Entertained 9,000 People July 4th

The first patriotic community celebration of Rantoul and Chanute Field was pulled off with marked success at the west end of Chanute Field, on July 4th, before a crowd estimated at between eight and nine thousand. The celebration consisted of a monster parade to the field, followed by a track meet, a ball game, exhibition flying. Beginning again after supper there was a band concert, wrestling and boxing staged on a large platform built in the center of the main street in Rantoul.

The parade, under the direction of Marshals Walker and Ehlert, of the post hospital, formed in the business center of town, marched through the business district and thence to the field. They arrived at the field a short time after one o'clock, and the band gave an excellent concert.

Through the courtesy of Major Krapf, a number of planes were on the field for inspection by the crowd, many of whom had never seen one but at a distance. They did some fine formation flying and then began doing all kinds of hair-raising stunts. Side slips, tail spins, loops, nose dives, stalls and everything in the stunt line was pulled off for the benefit of the onlookers. This lasted until 5:30 when the events at the field were brought to a close.

Flying instructors at these fields have the work divided as follows at present: Lieut. Slattery is in charge of the dual instruction; Lieut. Cupp has the acrobatic flying, and Lieut. Bandy is in charge of the solo flying. Lieutenant Kritzer is in charge of the formation flying and Lieuts. Ahney and Ritchie have the cross-country work. Each of these men are expert flyers and understand the game all the way through.

Chanute Field to Have Soldiers' Club House

The contract has been let for the building of a new Soldiers' club house at Chanute Field. Mayor Smith and the other members of the board of civilians consisting of W. A. Molloy and James F. Clark, visited the field and conferred with the board of officers consisting of Major Lorin C. Collins, Lieut. Winner and Lieut. McCormick. The building when completed will cost in the neighborhood of $5,000. It will face the south; will be 80x40 feet and will have a porch 10 feet deep running across the south end. It will be fitted up as a regular club house for the enlisted men of the field, and will fill a long felt want for the men have nothing to do when they go to town but hang around on the streets.

Tales from Taliaferro Field

Major George E. A. Reinburg, commanding officer, has announced the appointment of Major Thorne Deuel, lately executive officer at Kelly Field, as commandant of the School of Aerial Gunnery at this post. Maj. Deuel will have as his assistant Capt. Howard F. Wehrle who has been acting commandant for some time. Many improvements are being considered for this, the oldest and largest gunnery school in the country.

The first of the big shipment of new Thomas Morse scout planes has arrived at Taliaferro Field and the hum of their motors will soon be heard over the big 11,700 acre tract used as a gunnery range.

Eighty enlisted men, who have passed the preliminary mental and physical examinations at this field, have been appearing before an aviation examining board in Fort Worth this week and then taking their flying physical examinations. The successful candidates will be sent to schools of military aeronautics for training leading to commissions as flying officers. This is the first batch of candidates under the new policy opening the flying service only to enlisted men.

Thrilling Aerial "Combat" Held at Ellington Field

Using practically every turn, slide and stunt known in aviation, Major McDonnell and Lieutenant Baird, aerial acrobatic instructor at Ellington Field, staged one of the most thrilling "combats" that has been witnessed at the field in some time, on July 8th.

Necks craned out of every window in the barracks, and men on duty ceased their labors to watch these premier flyers endeavor to get on each other's tail.

Both officers went into spin after spin. First one would get in position for what could have easily been a deadly shot, when he was shaken off by a loop, spiral, side slip or spin.

Lieutenant Baird in several instances flew on his back. In this, it is safe to say that he surpasses perhaps any flyer in the United States using training machines.

The work of both officers brought cries of admiration from the hundreds of witnesses on the ground.

The "combat" lasted for nearly a half hour, during which time every minute provided a thrill. At times the duel was fought as low as 100 feet. First one would shoot almost vertically toward the clouds, only to be followed by the other. Then spin after spin followed.

This photograph taken during the christening of the first American-built battleplane in France, shows among others Captain K. G. Pullian, Jr., U. S. Army, Commanding Field No. 3. (Photograph Bureau of Public Information.)

Plane Hit Homing Pigeons

One of the planes from Chanute Field hit a flock of trained homers a short time ago and killed seven of them. The flier could not miss them, as they flew right in front of his machine.

Captain J. F. Morris, M.C.C.deG. of the British Royal Air Force, who has brought down twenty-nine German planes and is now in this country

Eddie Flies Home to Get Telegram From His Sister

Eddie Stinson flew home from Kelly Field on a visit to his folks.

Mrs. Stinson, who runs a farm on Alamo Heights, San Antonio, notified him that his sister, Katherine, the famous aviatrix, had sent him a wire.

Knowing Eddie would come home in a hurry to get the message, his mother expected him to motor over. But there was no sign of Eddie's auto.

It was his younger brother who spied him.

"There comes Eddie," he said, pointing to the sky. It was Eddie in his "Humming Bird," the small single seater scout. Spiraling around looking for a suitable landing, he finally alighted on Johnson's farm nearby. Then almost everybody came down to see Eddie, who is popular with the neighbors.—Kelly Field *Eagle*.

Cadets Build Ships in Which They will Fly

"The cadet builds the ship in which he must later fly," sums up the new system inaugurated by Lieut. Armand V. E. Smith, officr in charge of instruction in aeroplane construction at the Cadet Wing. The method, it is believed, is used only at Kelly Field.

Lieut. Smith in explaining the innovation said:

"In the ground schools, the cadets are taught to tear down and put together aeroplanes which never leave the hangar for the air. This is excellent instruction but when the cadets arrive at the flying school it is necessary to give 12 hours more in construction work.

"They have already learned about all they will learn of aeroplane construction unless they are given a different and totally new course of training," Lieut. Smith explained. "All men, and especially cadets, are always looking for something new.

"In this school they enter the different shops and gather up the parts of the aeroplanes. They take them to the hangar and there, under the critical eye of skilled instructors, they put the machine together. Knowing that they are to fly in it when it is completed, they are naturally vitally concerned over every particle of work done.

"An instructor does not utter a word of advice or criticism that the cadets do not heed because their lives are at stake. Carelessness might mean that the first man who went up in the ship would be killed."

The aeroplanes put together by the cadets are thoroughly tested by experts before the cadets take them up, and whenever an error in construction is found the cadets who put the machine together are shown what might have happened to one of their number had not the error been detected in time.

The object of the whole course, Lieut. Smith explained, is to make the cadets so thoroughly acquainted with aeroplane construction that they can inspect their machines before they take them up and also so thoroughly acquaint the flyers with the function of every stick and piece of metal that in case of a forced landing because of trouble, a broken rib, a torn wing or even things more serious, they will be able to crudely repair the damage well enough so their machine will take them home.

Actual construction of the wings and fuselage are the only features of aeroplane construction that the cadets are not now taking up under Lieut. Smith's plan of teaching. It is planned to make this feature of the work a part of the course as soon as possible.

Concerning Overseas Equipment

Baggage of officers below the grade of brigadier general, ordered to duty in France with the American Expeditionary forces, will be limited to one bedding roll, one locker, or its equivalent, and one piece of hand baggage. Horse equipment, when taken by mounted officers, will be allowed in addition.

No Canvas Leggins Worn Abroad

An order issued by the War Department relative to squadrons about to leave for overseas duty specifically states that every man leaving for abroad shall be furnished with spiral puttees and that canvas leggins must not be worn.

And on top of this comes the information that campaign hats are tabooed for winter wear. In their place those natty, saucy aviator-like caps will be worn, and just think, it's winterish over there mostly all the time. The soldiers in turn are wearing their web waist pack belt stripped of all its appurtenances.

French Ace Fonck's Official Total Now 56

Lieutenant Rene Fonck, one of the leading French aces, brought down two German aeroplanes on July 16, two on July 18, and three on July 19. Six of these machines were brought down in flames. Fonck's total is now officially fifty-six machines.

Air Service Military Aeronautics Division

The transfer from the Aviation Section of the Signal Corps to the Air Service Department of Military Aeronautics Division of the numerous officers whose definite status places them in the Aviation Section of the Air Service proper, and officers attached to the Production Department of the Department of Military Aeronautics, is being rapidly consummated.

250 Miles an Hour Is Possible in Air

London.—"It would be easy for any British aeroplane manufacturer to produce a machine which could make better than 250 miles an hour," declared Capt. W. G. Aston, one of the leading English experts on air mechanics. "This could be accomplished by merely altering the curvature of the planes. But this would mean a minimum landing speed of about 150 miles an hour, and there is the great difficulty.

"The machine would be unquestionably flyable, but its successful landing would require an aerodrome five or six miles long to say nothing of extraordinary skill on the part of the pilot."

Hempstead Field Now Mitchel Field

In honor of Major Mitchel and three other American aviators who have given their lives for their country, four Long Island aviation fields were renamed for them on July 24th. This honor was conferred upon the dead heroes at the suggestion of Major C. K. Rhinehardt, in command of the Long Island Provisional Flying Wing.

Field No. 2 at Hempstead will be known as Mitchel Field; Field Wantagh will be called Lufbery Field, in honor of Major Raoul Lufbery, the ace, who recently was killed in an air duel in France.

The field at Comac has been changed to Chapman Field, honoring C. G. Chapman, killed in France, and the field at Babylon will hereafter be known as the Henry J. Damm Field, for the aviator who was killed in action in May.

Airman Drop Supplies for Battalion in Peril

With the French Army—A French battalion was surrounded July 7 in the region of Lourcy and it was decided to revictual the beleaguered troops by aeroplanes. Some hours later more than 200 loaves of bread, quantities of biscuit and more than 250 tins of conserved meat were dropped by the airmen to the famished poilus.

On the following day a message came that the besieged troops were plentifully supplied with food, but lacked ammunition. Aviators again flew over them and dropped supplies of cartridges. Well fed and well ammunitioned, the Frenchman held the Germans at bay. They counter-charged brilliantly and held out until relief arrived on the night of the 8th.

Mexican Editors Fly at Kelly Field

'The flying exhibition at Kelly Field was wonderful," said Leo D. Walker, director of "El "Progreso," Monterey, Mexico. As leader of the party of Mexican newspapermen who visited Kelly Field July 12, on their way back to Mexico after touring the United States from coast to coast, he acted as spokesman.

Although Kelly Field was not the first aviation camp they had stopped at, it was there they had their first chance to see stunt and formation flying, staged in their honor.

"We never saw anything like it before," explained Senor Walker. "We certainly will tell the Mexicans what wonderful fliers you have here."

Musical Director Announces Plans

Langley Field, Va.—Private J. E. Carroll, musical director of the post has announced his plans of music for Langley Field that will include the following organizations: (1) A full military band; (2) orchestra; (3) choral singing; (4) quartette singing. A contest embracing the singing units of the various squadrons of the field will be arranged, to determine the personnel of the vocal organizations and sometime in the latter part of August will be given a combined orchestra and choral concert.

New System for Salvaging Wrecked Planes

Kelly Field, Texas.—A new system of operation of the wrecking department, Kelly Field Flying Department, designed to reduce by half the number of wrecked aeroplanes sent into the shops for general repairs, has been inaugurated by Lieutenant John M. Loeblein.

Following the fall of a machine or its damage in other ways, the pilot will immediately notify the wrecking department, providing he himself is uninjured, stating whether the damage can be repaired by dispatching new parts. If the aviator himself is injured, this report on the condition of the machine is made by the aviator who finds it.

If the machine can be made ready for flight by the use of one or more new parts and the location is such that a pilot can take them off, the required new parts are dispatched from the wrecking department with skilled mechanics to make the repairs.

If the ship is too badly demaged to be repaired outside the shops, the wrecking crew is sent out to dismantle it and bring it in, provided it is not more than 100 miles distant from Kelly Field.

If the machine falls more than 100 miles away, new parts are sent by express and mechanics sent by train to repair it, if field repairs are possible. If the damage is too serious for such repair, men are sent by train to dismantle the ship and return it to the field by express.

The elimination of unnecessary dismantling of ships and hauling over long-rough roads in motor trucks is the object of the new system. The jostling and jolting received in being hauled long distance by motor truck make it necessary to put a ship in the shops when the original damage might have been repaired quickly and easily.

The wrecking department is now in charge of Lieut. O. L. Weidmann.

American Flying Fatalities Fewest

Washington.—A statement issued by the War Department on August 4 sets up the claim that a new minimum record for losses sustained in training flights has been established in American aviation training camps.

"The figures relating to the safeguarding of cadets of the new army training for duty overseas as pilots and observers," says the announcement, "are now on a par with, if not actually lower than, the percentage figures of this nation's allies and are believed to be much under the figures of the Central Powers.

"United States schools, in attaining the present rating, have proceeded on the theory that three out of four deaths in flying at the front have been due to lack of judgment and that but one man out of four has been killed in action; further, that if a cadet were given all of his instruction in the flying schools in the United States he would put all of his air training out of mind when he finally reached the front and concentrate entirely on fighting. Because of the fact that he had been perfectly trained as a 'stunt' flier, it is said, he would be the more able to pick up his fighting tactics quickly.

"Official records show that from September 1, 1917 to and including July 20, 1918, the losses sustained in the actual flying training of United States air forces in this country by American units totaled 155, which for each four of actual flying training was .000305. In other words, the

(*Continued on page* 1074)

Each morning before proceeding with the work of the day each squadron at our aviation camps holds a formal parade as seen above. At this parade orders are read which effect the squadron. (Committee on Public Information)

The AIRCRAFT TRADE REVIEW

Aeroplane Spruce Brigade

Ten thousand soldiers of the National Army, working like beavers with an army of civilians in the Puget Sound woods, are now getting out aeroplane spruce at the rate of twenty million feet a month. This is a victory—equal in importance to a successful drive on the battlefield—due to the genius of Colonel Brice P. Disque, of the spruce production division of the aviation section of the Signal Corps.

Several months ago, when Disque tackled the task, industrial war was being waged between the lumbermen and their employees. The I.W.W. were making the most of it. Disque immediately reformed the conditions which were making rebels out of more than 50,000 loggers and millmen. He established the eight-hour day and decent housing and board. He organized the Loyal Legion of Loggers and Lumbermen, and in a short time 80,000 workers in the states of Oregon and Washington had taken the pledge of loyalty to their country and to their employers. He commandeered thousands of soldiers best fitted for forest work, in the various cantonments, to serve with the civilians on the regular civilian's pay. Spruce production leaped from two million to ten million feet a month, and now the Government is assured of twenty million feet a month—lumber perfectly straight in grain, free from knots, checks and blemishes.

Discipline in the woods is ideal. The soldiers' example in loyalty, energy, cleanliness and enthusiasm quickly was emulated by the civilians. All are early to bed, early to rise. Each day is a tournament of achievement. The soldiers "hang their idle armor upon the wall" in the forest barracks and "fight" eight hours a day side by side with their civilian brothers.—Charles Philip Norton in *Leslie's*.

Castor Bean Crop Aids U. S. Aeroplane War Aim

Austin, Tex.—It is shown by a survey that has just been made of the castor bean crop in Texas by representatives of the United States Department of Agriculture that there are more than 13,000 acres in cultivation and that a good yield of the beans is promised.

In the more southern part of the State harvesting the crop will be started soon. The Government will take over the entire production of motor oil produced from the beans. The success that has been met in growing castor beans in this State shows that the soil and climate are splendidly adapted to the new industry, the Government experts say, and there promises to be a big increase in the acreage next year.

With the development of the aeroplane for war use and as a means of general aerial transportation after the war, demand for castor oil as a lubricant for the machines will continue to grow, it is stated. For high altitude flying no other kind of lubricant fills the bill as well as castor oil, according to the tests that have been made.

Frank L. Wurl Appointed Remy Sales Engineer

Frank L. Wurl, who has been intimately connected with many new developments in automotive ignition, starting and lighting, has been promoted sales engineer of the Remy Electric Company, located at Detroit.

Mr. Wurl came to the Remy Company a few years ago as electrical engineer, but his marked ability soon placed him at the head of the research laboratories, where he has directed many moves in the constant improving of Remy equipment.

Mr. Wurl has already taken up his new duties of Sales Engineer, and his friends, both inside and outside the industry, are expressing their joy and satisfaction over the promotion.

Sends 1,000 Words a Minute

Washington.—"Telepost," a new device said to be capable of sending 1,000 words a minute over a single wire, was described by the inventor, Charles H. Selliman, at a meeting of the American Inventors' Association in the rooms of the Board of Trade on August 2. Mr. Selliman, it is understood, is in Washington to lay the device before the Post Office Department. It is claimed that "Telepost" is immune from wire-tapping.

The secretary of the association read a letter from Dr. F. W. Buck, president of the Buck Aircraft and Munitions Company, of Pueblo, Col., in which he announced that he expected to make a trial flight of his new metal aeroplane at Pueblo shortly. Colonel Samuel E. Adair of Brazil was admitted to membership. F. J. Hemen of Seattle, Wash., presided.

Storage Batteries for Aircraft

The extensive employment of electrical apparatus aboard the fighting aeroplane calls for some suitable source of power, and more and more aeronautical engineers are turning to the automobile practice of storage battery and generator and away from the European idea of a magneto. Battery current is required not only for ignition, but also for engine starting, night signaling, radio telegraphy, and photography. After many months of experimenting Mr. N. D. Sturges of New York City has produced a lightweight storage battery which meets the rigid requirements of the aeroplane designers. In order to accomplish his purpose he has had to manufacture very light lead grids and at the same time make them of sufficient strength to hold the active material without buckling, despite constant vibration. A special die had to be invented to allow the casting of unprecedented thinness. The results have been a battery of exceptional merit, and incidentally the lightest battery ever manufactured for watt hours per pound of elements. The battery is capable of a steady current of 20 watt hours per pound of elements, which is claimed to exceed any other battery; and it is only half as heavy as the average automobile starting battery, which weighs about 80 pounds. The overall dimensions of the aeroplane battery are: Length 9⅜ inches; width 6½ inches; height, 8¼ inches. The plates are 1/16 inch in thickness, nine to a cell, and six cells to a battery, or a total of 54 plates. The battery has an output of 50 amperes at 12 volts for 30 minutes.

M. A. M. A. Would Support Aeroplane Show

New York.—At the quarterly board meeting of the Motor and Accessory Manufacturers Association it was decided that this body will support an aeroplane show if such is permitted to be held by the War Department. The show committee of the association was instructed to make its usual contracts with the National Automobile Chamber of Commerce covering both the New York and Chicago shows.

E. W. Beach has resigned as a member of the executive committee because of his affiliation with the Bureau of Aircraft Production in Washington but will remain a member of the Board of Directors. His place on the excutive committee will be taken by William M. Sweet.

One new member, the Sewell Cushion Wheel Company, Detroit, was elected to membership.

Tuning the wires—trueing the aeroplane

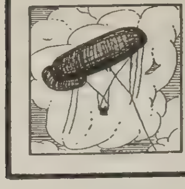
Spruce Lumber Price Up

Washington.—Increases averaging approximately $4 a thousand feet for New England spruce lumber were authorized on July 26 by the price fixing committee of the War Industries Board for the period from July 19 to November 1, 1918.

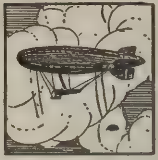
Personal Par

Finley R. Porter is now aeroplane engineer in charge of engine development. He was formerly chief engineer of the Mercer Motor Car Co. and afterwards designer of the F. R. P. cars at Port Jefferson, L. I.

A very delicate step in the manufacture of an aeroplane. Tuning up the flying wires. A wing which is ever so little out of alignment would make the machine very unstable



MILITARY AEROSTATICS



By Lieut. H. K. Black, R. F. C., C. F. A.

THE Cacquot Observation balloon is generally made of rubberized silk. I believe that there have been tests made lately with rubberized cotton. Just what the result of the tests have been I do not know. My personal opinion is that the cotton ought to be alright, though no doubt it is a bit heavier than the silk. Latter day balloons are considerably heavier than they used to be anyway. The stress of service and the rought times they are bound to encounter in France today necessitates a stouter material than used to be thought necessary.

In manufacture the fabric is cemented together. There are at least two piles of fabric in the ordinary balloon. In places there are three. The foregoing refers to the gas holding envelope. The rudder and the interior balloonet is generally only one ply thick. Where two or three ply material is used, the plies are cemented on the bias, thus gaining enormously in resistance to tears. As a matter of fact it is almost impossible to tear three ply balloon fabric with one's hands.

Almost without exception the panel system of manufacture is adopted in observation balloons, that is, rectangular panels of fabric are cemented and sewn together in the same form as bricks are laid. The balloon is somewhat less than ninety feet long from bow to stern and slightly less than thirty feet wide at the widest part. The greatest beam, to speak nautically, is about one third of the length from the bow to the stern. From here it tapers off somewhat toward the stern, thereby gaining a streamline effect.

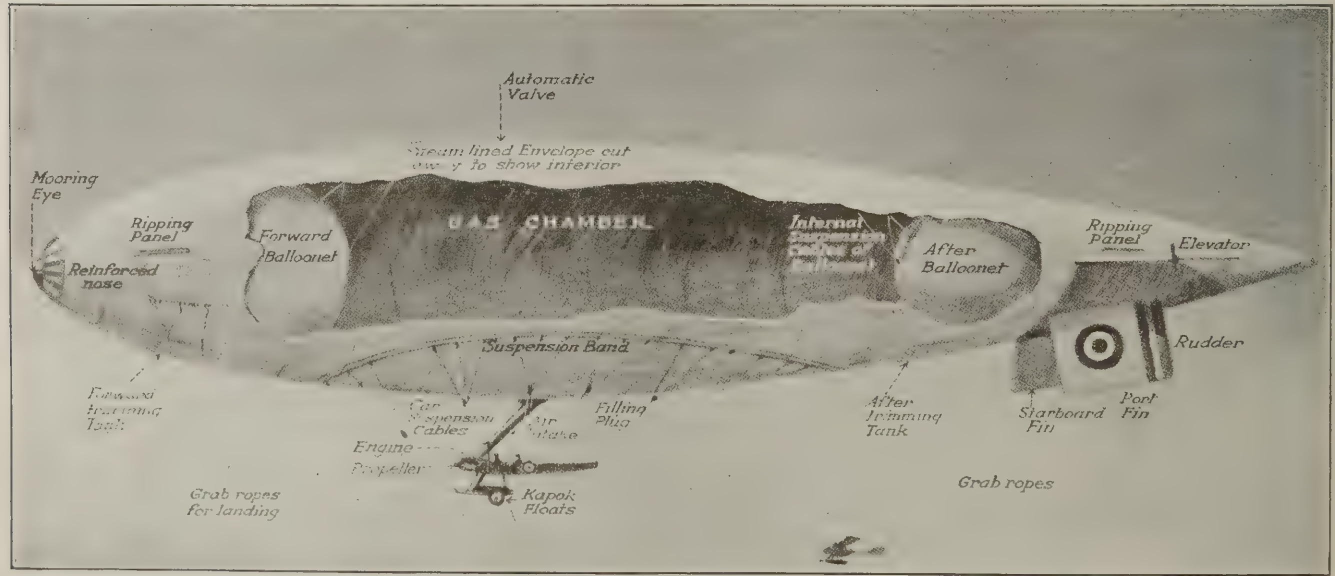
Outside the envelope, toward the stern, and underneath, is the rudder. This is a sausage-like arrangement which runs toward the stern and ends in two small pipes which communicate with the fins. The fins are approximately the shape of the rudder. They are placed toward the stern of the balloon somewhat above the equator. They used to be closed at the forward end but it was found that a small aperture added to the steadiness of the balloon so in the later types there was left a small hole about an inch in diameter. There are two sleeves for deflating the fins quickly which are always tied tightly when the balloon is in flight.

The fins are the chief things which keep the balloon steady. As a chain is as strong as its weakest link, so is an observation balloon as steady as its fins. The way the fins on some balloons behave would almost make one believe it a matter of temperament. If they are steady on its first flight the balloon will be a steady one. If the fins wobble on the first flight, nothing on earth will make that balloon a steady one. Such a wobbly balloon drags out its more or less short existence on the front thoroughly hated and cursed by its observers.

The fins and rudder lie flat to the envelope when the balloon is not in the air. On ascent, the wind blows into the rudder through a wind scoop, inflates it and passing up through the two small pipes, inflates the fins in turn. The time it takes to inflate them depends entirely on the strength of the wind.

The balloon is not as popular opinion seems to imagine, entirely filled with gas. Because gas expands and contracts very much according to atmospheric conditions, some means must be adopted so that the shape of the balloon will remain the same all the time. In other words, the internal pressure must remain constant. To accomplish this a balloonet filled with air was adopted. The balloonet occupies less than one third of the space inside the balloon. It runs diagonally from end to end from the lower surface at the bow to near the upper surface at the stern. It is made of single ply balloon fabric and is rather loose. It has an opening leading to the interior of the rudder. When the wind blows into the rudder it flows through into the balloonet. Not being able to escape, it is put under pressure of the wind entering the rudder. This raises the single ply balloonet until the pressure of the air in the balloonet is equal to the pressure of the gas contained in the balloon. As the gas expands under atmospheric changes it forces the balloonet down and drives some of the air in the rudder out. As the gas contracts, more air is allowed in the rudder and the balloonet forced up. Thus the interior of the balloon is kept at the same pressure at all times, under all atmospheric conditions. This being so the shape of the balloon is maintained, a very necessary thing, for upon the constant shape of the balloon depends its ability to fly correctly and safely. The action of the automatic valve holds a very close relation to this, and its action and description will appear in an early issue.

(To be continued)



A Blimp or Dirigible Airship shown in section. It shows the system of rigging. The Blimp is streamlined to offer as little resistance to the air as possible. The gas chamber is shown and the two balloonets, one at each end, which automatically equalize the internal pressure which makes the balloon keep its shape while flying

THE GERMAN H. W. BIPLANE

THE most interesting feature of the Hannover biplane, apart from the biplane tail which first drew attention to the machine, is the unusually deep body. Without having actually measured the depth of the body we should judge its maximum depth to be in the neighborhood of five feet. The reason for choosing such a deep body, the cross sectional area of which is great and must, it would appear, necessarily have a fairly high resistance, is somewhat difficult to follow unless it be assumed that the object has been to bring the heads of the occupants almost in line with a continuation of the chord line of the upper plane, thus giving pilot as well as gunnner a practically unobstructed view in a forward and upward direction. Whether or not this has been the cause cannot be definitely stated, but it would certainly appear to have had that effect. As if to further ensure that the gunner was free to look forward in line with the top plane, his gun ring is mounted in a form of turret, elevated some distance above the main top of the body. It is possible that the gunner has been able to increase his arc of fire beyond that usually coming within the providence of the crew of the rear gun, and fire forward between the planes. This would be possible on account of the fact that there is only one pair of interplane struts on each side of the body, the lift cables therefore running out at a rather flatter angle than is usual in a machine of this size. There would, of course, always be the danger of hitting a lift wire, unless a stop were provided preventing the gun from being fired when in line with a wire. Of this there does not appar to be any sign, and it is possible that the designer trusts to the gunner to refrain from firing while the muzzle of the gun is too close to a wire. That this little detail might easily be overlooked in the excitement of a scrap seems probable, but perhaps the German attitude towards this particular subject is the same as that expressed to us some time ago by a French friend while discussing this same feature. Our friend expressed himself as follows: "Well, suppose you do hit one of your own wires. You come down. *C'est la guerre.*" However, most pilots would probably prefer to leave the pinging of his wires to the other chap.

Constructionally the body of the Hannover biplane is that now so frequently found on German machines, a light framework covered with three-ply. In section, however, the body is somewhat unusual, in that at the point of maximum depth it has flat sides and bottom, with a curved deck, while near the nose, the section is nearly circular and the tail portion is oval in section, not unlike the tail of a fish. This seems rather the reverse of usual practice.

In the gunner's cockpit there is the usual hinged seat which can be swung back out of the way when the gunner wishes to fire from a standing position. On the port wall of the body there is a wood drum around which the aerial is wound, passing through a wide tube fitting in holes in the bottom of the body. Centrally placed, in front of the gunner's feet, is a framework of steel, mounted so as to pivot around a transverse horizontal axis, and telescopically sprung by two short lengths of tubes and coil springs, which appears to have been used for releasing the bombs. Immediately under this framework there is a sliding trap door in the floor, which reveals, when removed, another compartment underneath the floor boards, between them and the bottom of the body. It is, in fact, a sort of cellar, and a humorously minded visitor suggested that this was where the gunner kept his *lager,* but closer inspection revealed the fact that in this compartment, and immediately underneath the other, was another sliding trap door, operated by a rather clumsy arrangement of cables and pulleys, surrounded by a rail some eight inches high. When both doors are open the way is clear for the bomb to drop. The bombs were apparently carried in racks on the floor to the right of the release gear, while on the left a number of fittings appear to indicate that here was at one time mounted the wireless set. On the starboard wall of the body is a lever marked Kupplung (Clutch), which has probably been used for throwing the wireless into and out of gear. On the starboard wall are also a couple of electric connections of the wall plug type, used, evidently, for connecting up the gunner's electrically heated suit with the generator circuit. No gun was mounted on the machine we examined, but the gun ring and pivot were of the usual type.

In the pilot's cockpit there were the usual instruments on a dash, and in addition a couple of inclinometers of somewhat unusual type, one for indicating lateral inclination, mounted on the dash, and another for longitudinal angularity mounted on the starboard side of the cockpit. These inclinometers appeared to consist of an upper semicircle painted blue, which was fixed, and a lower semicircle, red in colour, which always remained horizontal. In appearance, the lower semicircle was like a piece of ruby glass, but probably a closer inspection would prove it to be a liquid contained in a semicircular container.

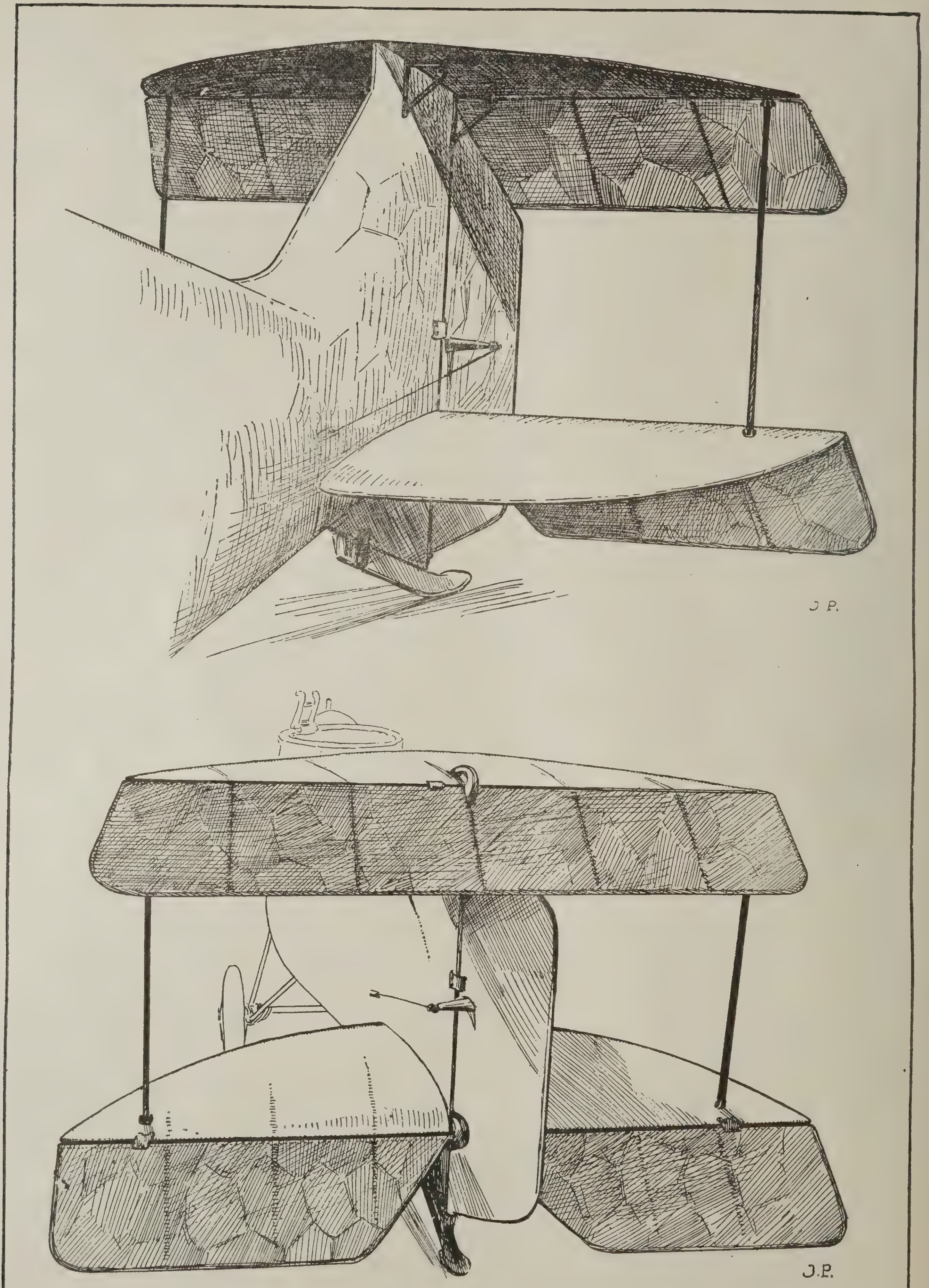
The controls did not present anything of especial interest. The control column terminated at the top in a double handle, the two parts of which sloped slightly downwards. On this was mounted the trigger for the machine gun, of which only one appears to have been fitted for use by the pilot. The seat was mounted on top of the main petrol tank, a large cylinder placed transversely on the floor of the cockpit. At the pilot's right hand was a hand operated pressure pump, which had a rearward extension enabling it to be worked by the gunner at will. A stamp on the wall of the cockpit gave an indication of the date of manufacture. The stamp read ZAK—which apparently corresponds to our A.I.D.—6/12/17.

Although not in place on the machine we inspected, the wings were available for examination and showed that the span of upper and lower wings was approximately equal. The chord of the upper plane was considerably greater than that of the lower. There was only one pair of interplane struts on each side in spite of the considerable span of the machine, and the top plane had a centre section mounted on two pairs of N's sloping out slightly. The tips of the top plane were raked, and the wing flaps balanced and warped. The lower planes, on the other hand, had rounded tips of the shape commonly known as Bleriot tips from their similarity to the wing tips of that well-known designer's early monoplanes. In the middle of the centre section of the top plane the trailing edge had been cut away, and between the spars were mounted, on the port side the petrol service tank, and on the starboard side the radiator. The latter was partly covered by a semicircular shutter which could be rotated out of the way to give increased cooling. The amount of variation in cooling thus obtainable appeared, however, to be very small.

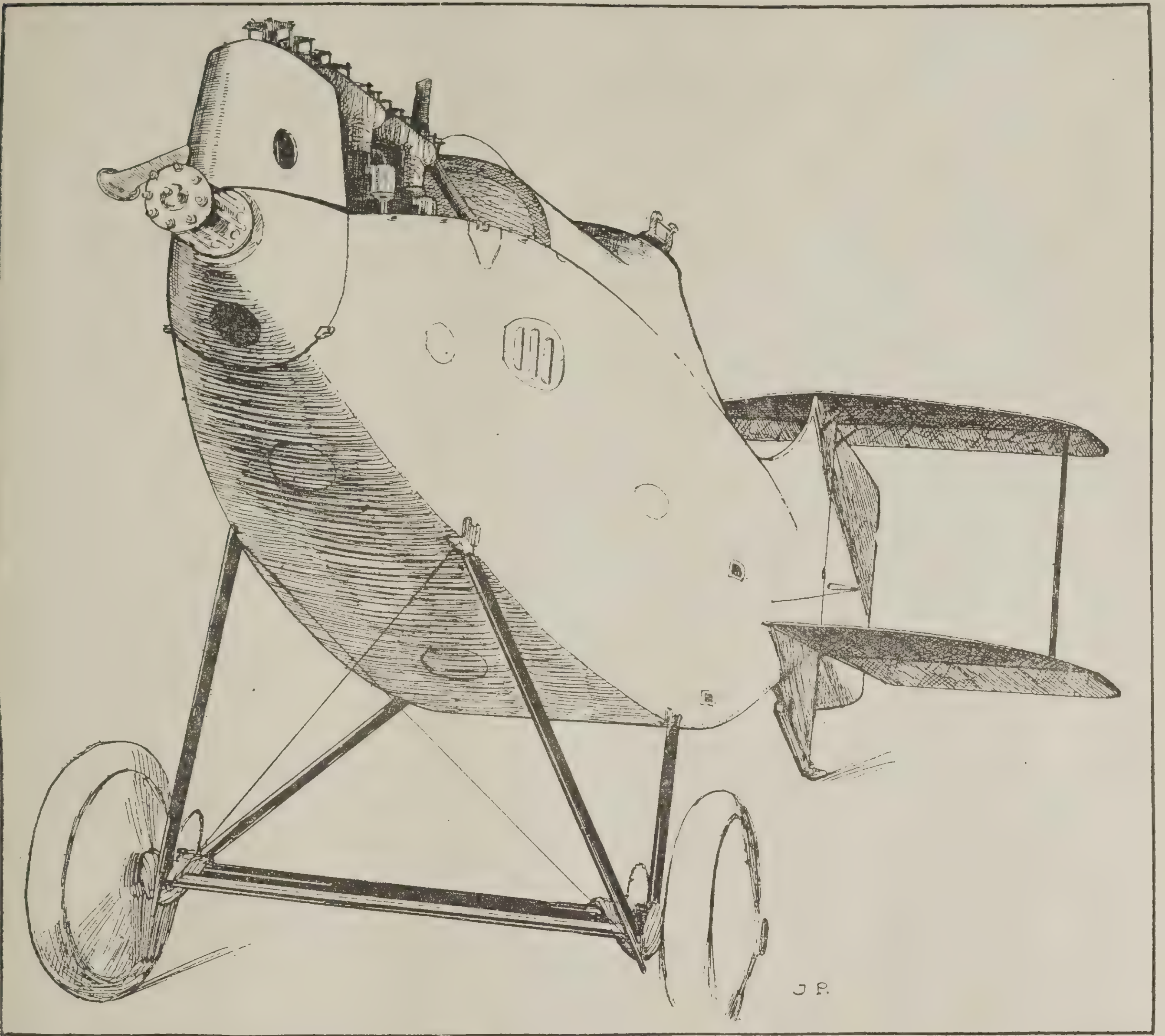
The motive power was furnished by an Argus engine partly covered in, each three cylinders of which had a common exhaust collector projecting out past the struts of the starboard "N" carrying the top plane centre section. The under carriage was of the Vee type, and appeared to follow along standard lines.

As regards the biplane tail planes, the arrangement of these will be easily followed from an inspection of the illustrations. In design they did not appear to present anything very unusual, and the only point of interest appears to be that although the two fixed planes are connected by struts there is no wire bracing. Each plane is therefore to be considered a simple cantilever, and as their section did not appear to be very deep, the strength would not appear to be all that it might. One can only wonder at the reason for employing a biplane tail. Probably it is to be sought for in the effect of the down draught from the wings, placed as they are close to the top of the body.

On the two pages following will be found three very interesting illustrations of this much discussed plane. Some of the details shown have never, we believe, been published before in this country.



THE HANNOVER OR "MYSTERY" BIPLANE.—Two views of the biplane tail. The elevator of the lower tail plane, it will be noticed, is divided, while the upper elevator is carried right across from side to side. The two elevators are interconnected by a vertical rod inside the fin, joining the cranks of upper and lower elevators.



THE HANNOVER OR "MYSTERY" BIPLANE.—Three-quarter front view of the body. The chief feature of this machine, apart from the biplane tail, is the enormously deep *fuselege*, built in the usual German fashion, of a light framework covered with three-ply wood.

Allies Bag 254, Lose 226 Aeros Since July 15

THE tremendous air fighting and consequent enormous losses of machines in the great battle are shown by official reports of both combatants. Since the resumption of the second battle of the Marne July 15, in two weeks of fighting, the French and British machines acting in conjunction have brought down 138 German aeroplanes, while the British tactical force acting independently accounted for 99 more destroyed and 17 driven down, making a total of 254 enemy machines lost.

The Germans for the same period report bringing down 226 Allied aeroplanes, showing what new production must accomplish to keep pace with the wastage.

The Allied aircraft played an enormous part in the great battle, particularly in what the British style the enemy's back areas, which consist of the enemy's lines of communication, his supports, ammunition dumps and concentrations. Aeroplanes constantly raided enemy railway stations and the Marne bridges, and silenced numerous batteries, bombed and machine gunned advancing infantry and caused innumerable casualties at the Marne crossings. The railway particularly has been harassed.

The important German strategical railway junction, Fismes, has been continually bombed with disastrous results to enemy facilities. Maisonbleau station was bombed twice, Villeneuve twice, Fere-en-Tardenois twice and Bazoches twice during the same period.

For His Country

Quentin Roosevelt—France—July 14, 1918

By Minna Irving

It was morning and Sunday, he mounted his plane
And took like an arrow the Speedway of blue;
Over trenches and dugouts and shell scarred terrain
And the Kaiser's gray legions he dauntlessly flew.
The son of his father could never know fear,
And he rose like a bird to the German attack,
And his comrades beheld him at last disappear
In a billowy cloud on the aerial track.

They listened in vain for the beat of his wings
Returning at dusk to the long allied line;
But night hawks and owls were the only live things
That soared in the moonlight's pale shimmer and shine.
"We will send," said the airmen, "an escort of Huns
To follow brave Quentin aloft in the skies."
So, behold! they are rapidly notching their guns
And sparing no Fokker or Gotha that flies!

The hangar is dark whence he wheeled his machine
And exultantly answered the call of the air,
But his country is keeping his memory green
With laurels of glory unfailingly fair.
A gallant young spirit adventuring far,
In spaces eternal he wanders at will;
So a scintillant, golden and glorious star
Is shining to-night over Sagamore Hill!

THE "GRAIN" OF WOOD WITH SPECIAL REFERENCE TO THE DIRECTION TO THE FIBERS

By ARTHUR KOEHLER

Specialist in Wood Identification, Forest Products Laboratory, Madison, Wisconsin

UPON the direction of the grain in woods used in aeroplane construction may depend the strength of the machine and the safety of the pilot. It is, therefore, of great importance that the inspector be familiar with the different kinds of "grain" and be able to determine the direction and slope of the fibres, so that he may eliminate pieces which, on account of their cross grain, would be likely to reduce seriously the margin of safety.

There are various kinds of "grain" in wood, and various uses of the word. The annual rings are often considered as constituting the grain. Woods with wide and conspicuous rings are said to be "coarse grained," and those with narrow rings, "fine grained." If each annual ring is composed of a hard and a soft layer, as, for example, in the yellow pines, Douglas fir, oak, and ash, the wood is said to have an "uneven grain," as contrasted with the "even grain" of white pine, basswood, maple and mahogany. Occasionally "uneven grain" is used with reference to woods in which the anual rings are very irregular in width. Cypress is often of this nature.

When lumber is sawed along the radius of the annual rings, it is said to show "edge grain," that is, the "edge" of the annual ring shows on the face. This is also known as "comb grain" and "vertical grain." When lumber is cut parallel or tangent to the annual rings, it is said to show "flat grain." In grading rules a slope of 45° for the annual rings is considered the line of demarcation between edge grain and vertical grain. The cross section of timber is usually called the "end grain."

For woods in which the annual rings are inconspicuous as in maple, red gum, and mahogany, the word "grain" is rarely used with reference to the annual rings. Thus the expression "coarse-grained maple," "uneven- grained red gum," or "edge-grained mahogany," is seldom used.

The word "grain" is also used with reference to the size of the pores; woods with comparatively large pores, such as oak, chestnut, ash, and African mahogany, are said to have a "coarse grain," while those with small pores, such as maple, cherry, basswood, and red gum are called "fine-grained." Painters designate them as "open" and "close grained," respectively, the former requiring a filler. Occasionally the word "texture" is used in place of "grain" in describing the width or uniformity of the rings or the size of the pores.

Since the term "grain" is used in describing a number of different characteristics of wood, it would help considerable to avoid confusion if the width of the rings were expressed by the terms "wide-ringed," "narrow-ringed," or "with rings of medium width"; the uniformity or irregularity in the structure or width of the rings, by "even texture" or "uneven texture"; and the size of the pores, by "coarse texture" or "fine texture." The terms "edge grain" and "flat grain" are more definitely fixed in their meaning and should be retained.

A common use of the term "grain" is to describe the direction in which the fibres extend in a tree or piece of lumber.

"Straight grain" means that the fibres run practically parallel with the main axis of a tree, or are parallel with the main axis of any given piece.

"Spiral grain" means that the fibres extend in an oblique direction circumferentially in the tree, so that if extended they would wind around the tree trunk, forming a spiral, (see Fig. 1). Wood which has a spiral grain, when split radially, produces a twisted surface.

"Interlocked grain," also called "cross grain," is caused by alternating layers of wood being spirally grained in reverse directions; that is, the fibres put on for a number of years may slope in a right-handed direction, and then for a number of years the slope reverses to a left-handed direction, and later changes back to a right-handed pitch, and so on (see Fig. 2). Such wood is exceedingly difficult to split radially although tangentially it splits fairly easily. Interlocked grain is common in black gum, red gum, some cottonwood, eucalyptus, and many tropical trees.

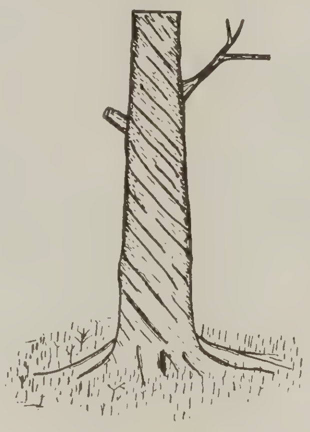


FIG. 1

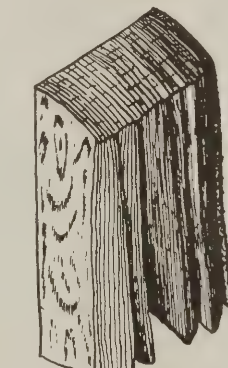


FIG. 2

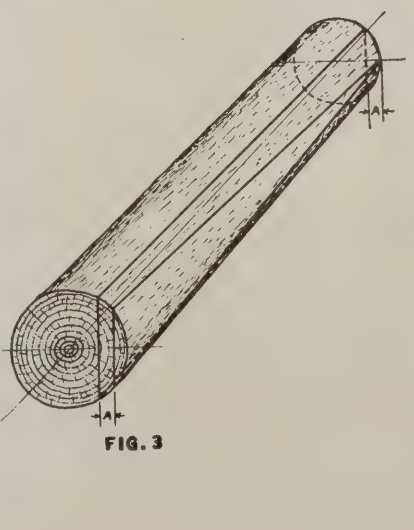


FIG. 3

Diagonal grain is the slanting of the wood fibres brought about by causes other than spiral grain in the tree. Usually it is due to sawing straight grained timber in a direction not parallel with the fibres, a procedure to be avoided, if possible, in cutting stock in which strength is an essential feature. Curvature in the tree trunk and other irregularities in the grain outside of local wavy and curly grain may, however, make it impossible to avoid the production of diagonal grain in cutting up certain logs. The common method of cutting lumber is to saw parallel with the central axis, which produces more or less serious diagonal grain in the lumber, depending on the taper of the log (see Fig. 3). Obviously, diagonal grain weakens the lumber, and several mills cutting aeroplane stock are now cutting parallel to the outer surface of the log. Diagonal grain may also be produced by cutting up quarter-sawed lumber and not getting the faces parallel to the annual layers of growth (see Fig. 4), or by cutting up plain sawed lumber and not getting the faces parallel to the direction of the fibres (see Fig. 5). Diagonal grain produced in the latter way is difficult to distinguish from natural spiral grain in the tree. However, since so far as is known, they are equally weakening, there usually is no need to distinguish between the two.

Both spiral grain and diagonal grain are also called "cross grain." Natural spiral grain can be detected by the twisted surface produced in splitting long pieces, and, according to Oakleaf*, usually by the fact that the parabolas and elipses produced by the intersection of the annual rings with the flat surface, do not extend in the same direction as the fibres.

How to Determine the Presence and Slope of Spiral Grain on the Tangential Faces

Spiral grain can be detected most easily by splitting wood in a *radial* direction. This, of course, mutilates the piece and is not always permissable. The direction of seasoning checks on the *tangential* surface also indicates the direction of the fibres. If no checks are present the direction of the resin ducts (brownish hair-like lines), which are found only in pines, spruces, Douglas fir, and larch or tamarack serves as a guide for determining the slope of the grain. In the hardwoods, especially in species in which the pores are distinct, such as ash, oak, hickory, walnut, mahogany and birch, the direction of the pores indicates the direction of the grain. Coniferous woods seem to be more subject to spiral grain than hardwoods. If the resin ducts are absent or obscure, or if the pores in hardwoods are obscure, the direction in which ink spreads will indicate the direction of the grain. This test can best be applied by using a fine pointed pen and an alcohol solution (about ¾ alcohol and ¼ water) of some dye like safranin. If the pen, dipped in the dye, is pressed slightly into the wood, the dye will spread from about ⅛ to ¼ of an inch along the fibres. The direction of the grain can be followed up by again placing the pen point at the extreme to which the ink has spread along the fibres, and so on, until a line sufficiently long to determine the slope of the grain has been made.

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*Oakleaf, H. B.—"Inspectors' Manual, Equipment Division, Signal Corps."

Some determine the direction of the grain by picking up the fibres with a knife and observing in which direction they tear out. The presence, but hardly the slope, of spiral grain may also be determined by the dip of the fibres where chips are torn out of the radial surface by the planer. With a hand lens magnifying about 15 diameters the direction of the fibres can plainly be seen. In no case should the direction of the annual rings on the tangential face be taken as the direction of the grain.

The slope of the grain on the tangential face is usually expressed as the number of units (inches or other units) along the length of the stick in which the grain deviates one unit from a radial plane parallel to the main axis of the stick. This is expressed as 1 in 12, 1 in 30, etc.

How to Determine the Presence and Slope of Diagonal Grain on the Radial or Tangential Face

Diagonal grain on the radial surface can usually be easily detected by the direction of the annual rings. The slope of the grain on the radial face is expressed as the number of units along the length of the stick in which the grain (annual rings) deviates one unit from a tangential plane parallel to the main axis of the stick.

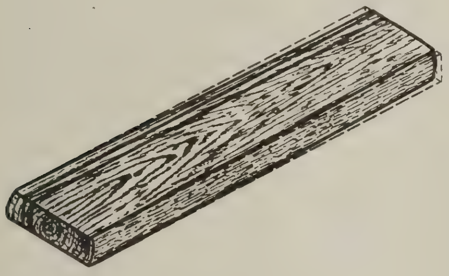


FIG. 4

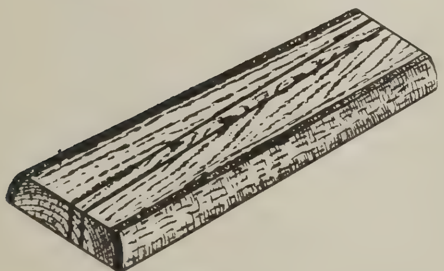


FIG. 5

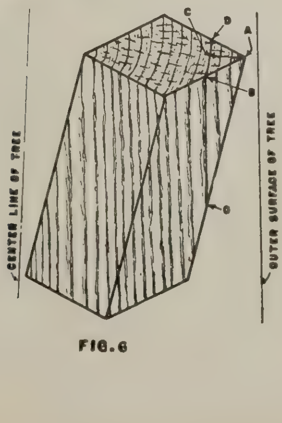


FIG. 6

Diagonal grain on the tangential surface and its slope can be determined in the same manner as spiral grain, from which it need not be differentiated.

It must be remembered that if the stick has any taper, the slope of the fibres with respect to its *main* axis, and not to the surface of the stick, gives the true slope of the grain. This is equally true for spiral grain.

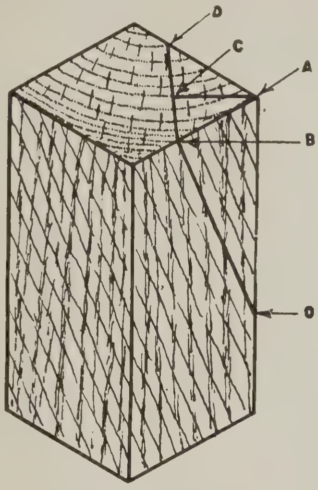


FIG. 7

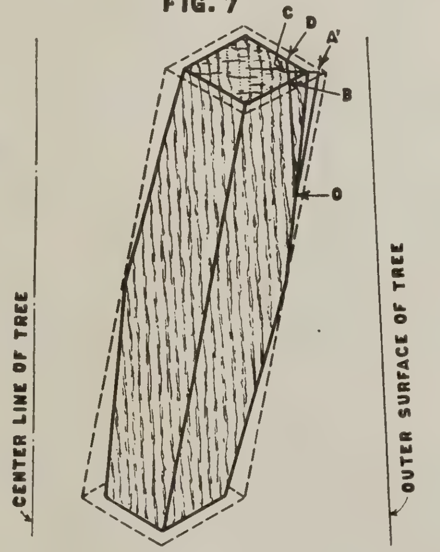


FIG. 8

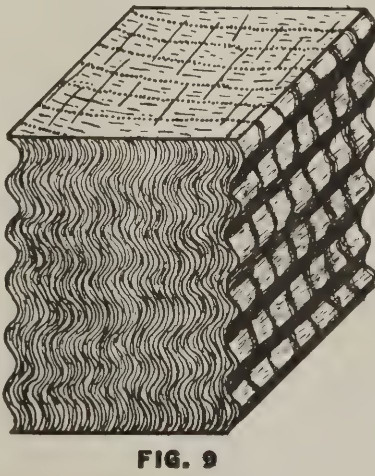


FIG. 9

The slope of either spiral or diagonal grain may be more in one portion of the stick than in another; therefore, the entire length of the stick should be examined.

How to Determine the Presence and the Slope of Spiral or Diagonal Grain When the Surfaces Are Not Truly Radial or Tangential

On shaped sticks which are round or oval in cross section, surfaces sufficiently tangential or radial to determine the direction and slope of the grain may be found. The direction of the grain in rectangular pieces may be determined as in other pieces in which the faces are truly tangential or radial, that is, by splitting, checks, direction of resin ducts, pores, medullary rays, and annual rings, or by the ink test, depending on whether spiral or diagonal grain is being looked for.

The slope of the grain in rectangular pieces may be determined as follows:

Diagonal grain.—Starting some distance from the end and on the edge farthest from the center of the tree, or on the edge nearest to the center, trace back an annual ring to the end of the stick, as O B in Fig. 6. Follow the ring across the stick, as B C D. Measure the distance from the corner A to the ring B C D. Then (the distance) A C in (the distance) A O is the true slope of the grain.

Spiral grain.—Starting some distance from the end on one of the two edges which are neither farthest from nor nearest to the center of the tree, trace back the grain to the end of the stick, as O B in Fig. 7. Draw the radial line B C D and connect A with the nearest point on the line B C D, then (the distance) A C in (the distance) A O is the true slope of the grain at that part of the stick. In some woods, and even in conifers containing resin ducts, it is often exceedingly difficult to find the proper direction for the line O B, so that splitting off a corner may be the only accurate way of finding the slope of the grain.

If both spiral and diagonal grain are present in a stick the direction and slope of each may be determined separately by the methods above.

If the stick has any taper, as is often the case in fuselage struts (the distance) A'C in (the distance) A'O (Fig. 8) is the true slope of the grain where A'O is parallel to the main axis of the stick.

Other Irregularities in the Direction of the Fibres

True wavy grain is due to a wavy arrangement of the fibres, producing undulation on a split *radial* surface. (See Fig. 9.) Wavy grained wood will split straight tangentially but the wavy direction of the fibres can be seen on the tangential surface. Irregular protuberances on the tree trunk may produce one or several "waves" in the annual rings. This is seen best on the radial face. (See Fig. 10.) In this case the waves are not as regular as when the undulations occur on the radial face. A bulge in the annual rings may indicate the presence of a pitch pocket toward the inner side of the tree.

Curly grain is an irregular distortion of the fibres as seen on the tangential surface. (See Fig. 11.) It is produced in the healing over of knots or injuries received by the growing tree. It can be detected by noting carefully the direction of the fibres or the irregular way in which the fibres are chipped out by the planer knives. The ink test is also good for determining the direction of the fibres in curly grain.

Knots.—Knots are weakening because of the distortion of grain which they produce, although they are denser as a rule than the surrounding wood. Knots start nearly always at the pith and grow in diameter from year to year, so that they are cone shaped, with the apex at the pith (Fig. 12). Knots from sprouts which come out of the side of the tree trunk do not, of course, originate at the center; but such knots are rare in forest grown material.

"Live" or "Sound" knots are intimately connected with the fibre of the surrounding, wood especially from the lower side, because here the sap brought up from the roots must flow from the sapwood of the trunk to the sapwood of the branch and thence to the leaves. From the upper side the connection is less intimate, and for this reason the cleft in a knotty piece of wood split from the lower side usually runs into the knot; but the cleft in a piece split from above may run around the knot, and the wood is more easily split.

After the limbs have served the tree for some time, the lower ones may become overshadowed by the growing crown to such an extent that they die. After a branch is dead it forms no further connection with the surrounding wood, and often if cut across, as in plain sawed lumber, it can be removed. Such a knot is called a "loose knot.' If the knot is firmly held in position, but is surrounded by bark or pitch, it is termed as "encased knot." A knot cut lengthwise is called a "spike knot," and a knot less than ½ inch in diameter is called a "pin knot."

Dead branches may persist for a number of years but eventually break off. The annual rings of wood which are formed subsequently grow over the stub. At first considerable distortion of grain may be produced when a branch heals over but eventually the grain becomes straight.

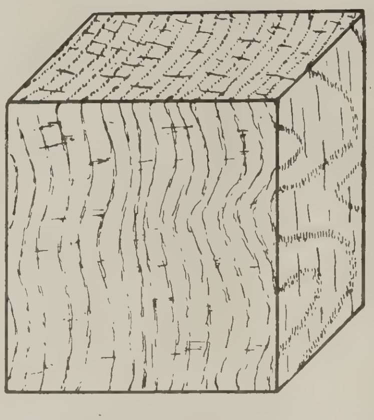


FIG. 10

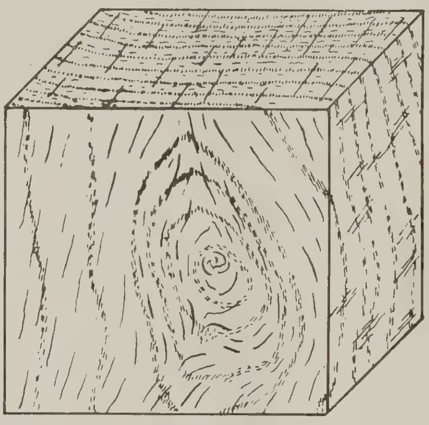


FIG. 11

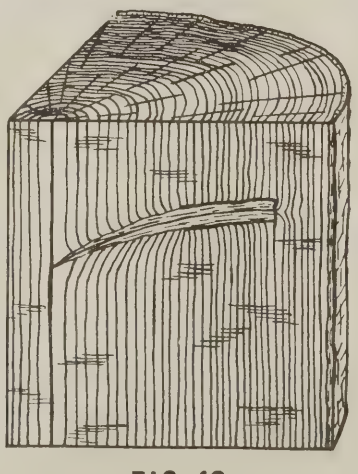


FIG. 12

Corporal James R. Doolittle

Corporal James R. Doolittle of 2,017 Caton Avenue, Brooklyn, formerly a member of the Lafayette Escadrille, who was killed on July 26th in an aeroplane accident at Buffalo, received thirteen wounds while flying on the western front, was cited for gallantry in British and French war orders, and was personally decorated with the British Military Cross by King George. He also received the Croix de Guerre.

According to his father James D. Doolittle, formerly a San Francisco publisher, Corporal Doolittle, who was born in Chicago twenty-four years ago had studied at both Columbia and Harvard Universities. In 1916 he went to France and served for a few weeks with the American Ambulance, later enlisting in the Foreign Legion.

After training at an aviation school at Buc, he had his first accident on May 2, 1917, when he fell 700 feet at Belleville, receiving seven injuries. A few weeks later he took part in bombing the Krupp Works at Essen.

On July 17, 1917, while protecting the Canadian balloon system west of Lens, he engaged four German planes, downing three before the fourth aviator wounded him four times and disabled his motor. Doolittle glided down over the first British line and was wounded again by shrapnel from British anti-aircraft guns, which succeeded in chasing away his opponent.

Returning to this country last Fall, he volunteered as an instructor in the American air service, and served at Mineola, San Antonio, Gerstner Field, La., and Dayton, Ohio. While acting as chief tester at Dayton he was injured in another fall. Then he was transferred to Buffalo.

Men on Pass Over 24 Hours Entitled to Reduced Fare

From the baffling maze of reports in connection with the reduced rate of railroad fares for soldiers and sailors comes at last a crumb of definite and detail information. This information is authentic, and, since it is issued by the Secretary of War for the guidance of Company Commanders and others concerned, is final.

The question ever uppermost in the mind of the soldier is whether, when going home on a short pass, he can derive the benefits of the two-thirds reduction in the railroad fare, or whether the privilege is to be extended but once—that is, just prior to his embarkation for active service overseas.

Bulletin No. 97, issued from Headquarters, Eastern Department, solves the question. The bulletin states clearly that men going on passes, whether they are going home or whether they are visiting relatives elsewhere, are entitled to the special form distributed to company commanders and officially known as the "furlough fare certificate." This certificate, when presented at the time the railroad ticket is purchased, entitles the bearer to travel at one third the regular rate.

Aero Post Defies Storm

Washington.—The mail aviators are demonstrating that it is possible to fly safely in any sort of weather. On July 25 Lieut. Stephen Bonsal coming to Washington from Philadelphia, encountered a terrific storm at Laurel, Md., while he was flying at a height of 5,000 feet. Without changing his course, he held on, although a heavy black cloud enveloped him, and he had no means of steering except by compass and a general sense of direction and rate of speed.

No landmark was visible for twenty minutes, yet Lieutenant Bonsal kept up his speed until he decided that he ought to be in the neighborhood of Washington, and descended sharply to find he was across the Potomac River just beyond the naval wireless station near Arlington, Va. At an altitude of 300 feet Lieut. Bonsal righted his plane and swept across the river and made a fine landing at the Polo Grounds, the regular landing place, in a driving rain. He has made the trip on schedule time.

On July 25 an important package was sent to New York by aeroplane, and at 3:45 P.M. a message by wire acknowledged its receipt. One patron of the service sends an important daily letter and has had only one failure in a month, and on that occasion the letter was delivered at 9 P.M. of the day it was mailed in Washington. Expecting it to be delivered in business hours, the sender made the failure the subject of a formal complaint.

Cost of Operating Aero Mail About Fifty Cents Per Mile

The Post Office Department authorizes the following:

The first report of the comparative cost of the operation and maintenance of the Aero Mail Service shows that the aeroplanes used in this service have broken all records for economy of gas consumption.

The total of all operating expenses of nine aeroplanes covering flights aggregating 7,234 miles, was about $3,682. The total consumption of gas representing 113 hours and 8 minutes of flying was 1,377 gallons, which is $32.50 per hour, something over 50 cents per mile. The total cost of gas was $405 in flying 7,234 miles.

The best performance in flying was made by a Curtiss J-N-4 machine, which flew 26 hours and 40 minutes at a cost of $28.01 an hour and covered 1,719 miles at a cost of 43½ cents per mile. A plane equipped with a Hispano-Suiza 150 horse-power engine used approximately 8 gallons of gas per hour, and a plane equipped with a 500 horse-power Liberty motor used 17 galloons per hour. This shows 40 per cent less gas consumed than generally required for aeroplane engines of these sizes.

The calculation of operating cost includes departmental overhead charges, interest on investment, replacement of parts, deadhead time of mechanics, gas, lubricating oils, office force, motor cycles and trucks, rent, fuel, light and telephone, pay of pilots, hangar men and mechanics.

The average consumption of gas for the nine planes was 12 gallons per hour.

Aero Mail Expansion Planned

Washington.—Rapid expansion of the aero mail service with eventual country-wide scope will begin August 1, when the aero mail service will pass from the War Department to exclusive post office control. College Park Aviation Field, 8 miles from Washington, has been selected as the new Washington terminal. Motorcycle delivery will be made from that point to the city. Army aviators returning from the war will have the preference in this service.

The first flight under the new system will begin August 1, when it is possible that another reduction in service charges from 6 cents per ounce to 3 cents per ounce with the usual 10 cent special delivery charge will be announced.

It is also planned to shortly inaugurate an 8 hour aerial mail route from Chicago to the East.

Mail 'Plane to Fly in Winter

Washington.—How to carry aeroplane mail in the snowstorms and cold of winter is a problem the Post Office Department has so far solved that Second Assistant Postmaster-General Praeger said the service between New York and Washington would be carried on steadily throughout the winter.

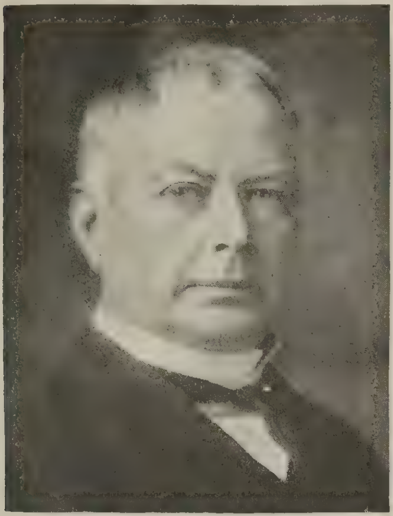
"We expect our 'planes to be carrying the mail when the railroads are blocked," he announced.

The chief difficulty is to prevent snow and sleet so accumulating on the windshield as to make it impossible for the pilot to see his way. This has not been entirely met, but is being studied. It is possible that more frequent stations, with stops about once an hour, will have to be arranged.

Mr. Praeger said that a New York and Boston route would be established, and there would be other new routes just as soon as winter flying had been completely mastered and the needed planes could be had without interfering with the army.

"Use of the aeroplanes in stormy weather does not claim attention by the army," said Mr. Praeger, "because observations as a rule are taken in clear weather."

The aviators will be made comfortable by electric warmers inside their mittens and in their shoes if necessary, and by heat from the engine.



Postmaster General A. L. Burleson

New Aero Mail Record

Just before 11 o'clock on August 1st, Otto Praeger, Second Assistant Postmaster-General, telephoned Postmaster Patten from Washington that the Post-office Department wanted the plans and maps of the Woodrow Wilson Airway at once. The plans were made by Henry Woodhouse of the Aero Club of America and show all routes, elevations and landing places for aviators between New York and San Francisco, crossing New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Iowa, Nebraska, Wyoming, Colorado, Nevada and California.

The Postmaster sent a messenger to Mr. Woodhouse and the papers were piled into a scout plane at 11:30 A. M. Two hours and thirty minutes later they were in Washington.

The time is a new record for carrying aerial mail.

Aero Mail Triumphs Over Storms

The Aero Mail Service furnished another demonstration on July. 31st of the practicability of making air flights in all sorts of weather. Lieutenant Killgore left Philadelphia at 1:25 P. M. in a severe rainstorm, flying the entire distance through a blinding rain which obscured all visibility and reached Washington on schedule time—3 P. M. After leaving Philadelyhia Lieutenant Killgore broke his goggles and was compelled to fly the entire distance without protection to his eyes. He flew at the height of about 1,500 feet, and the rain and wind encountered were very heavy all the way. He was compelled to fly by compass and the guidance of judgment acquired from the experience of frequent flights over the route.

The success of the aero mail pilots in flying through the storms which destroy all visibility and subjects them to the influences of heavy winds, is regarded with great satisfaction by the Post Office Department. The ability of the pilots to fly regardless of weather is of more importance to the service than the accomplishment of extraordinary feats of speed under favorable conditions, as upon the regularity of the service rests its practical dependability at all times.

To start with, flights through storms were regarded with some apprehension lest the regularity of the service should be hampered by weather conditions. During the past two months several very severe storms have been encountered by the postal airmen, yet every flight undertaken through a storm has been successful, and that of Lieutenant Killgore was made without loss of time.

The greatest service to business which the Post Office Department expects from the Air Mail Service in winter time will be the keeping open the lines of written communication during those distressing periods following blizzards when railroads are frozen up or snowed in for days.

Second Assistant Postmaster Otto Praeger

Aerial Mail Between Vienna and Lemburg

A regular aerial postal service between Vienna and Lemburg has been established by the military authorities since March 31st last. It is understood that the postplanes of this service carry mostly official dispatches, although private mail is accepted if the letters are franked with a special stamp, for which the price is about four times the ordinary rate. The aeroplanes make the trip in about seven hours, as compared ot 17 hours by express train.

AERIAL MAIL SERVICE TO BE EXTENDED TO CLEVELAND AND CHICAGO

Captain Benjamin B. Lipsner, the first Superintendent of the Aerial Mail Service, U. S. Post Office. Capt. Lipsner's foresight and energy are, to a great extent, responsible for the remarkable demonstration during the past weeks which proved that the aerial mail service can be operated on schedule time, rain or shine

THE Aerial Mail Service has started in a new period of development—a new epoch which is to mean more for the future than we now realize.

Three announcements of importance in connection with the aerial mail service during the past week were (1) the announcement that the service is to be extended to Cleveland and Chicago, and (2) the delivery of six aeroplanes to be used exclusively for aerial mail purposes, and (3) to be piloted by regular aerial postmen.

We explain editorially in this number the military importance of the aerial mail service.

The delivery of six fast aero mail planes to the Post Office Department of the U. S. government by the Standard Aircraft Corporation at Elizabeth, New Jersey, in the presence of Second Assistant Postmaster Otto Praeger, and Mr. Edgerton, Captain B. B. Lipsner, Superintendent of the Aerial Mail Service; Alan R. Hawley, President of the Aero Club of America; Mr. Henry Woodhouse, Vice-President of the Aerial League of America and Editor of *Flying*. Mr. Augustus Post, Secretary of the Aero Club; Captain Robt. Bartlett of the U. S. Army Transport Service, the famous explorer; Captain Frederick Libby, Postmaster Norris of New York City, Postmaster J. F. Sinnott of Newark, Postmaster W. C. Burton of Brooklyn, Posmaster William F. Barry of Elizabeth, Mayor Byron G. Jones, and many other notable army and Post Office authorities, was one of the most propitious events for the extending of the aero mail routes. President Harry Bowers Mingle on behalf of the Standard Aircraft Corporation made the formal deliveries.

The Post Office authorities, officers of the army and navy, officials of the Aero Club of America, representatives of *Flying*, AERIAL AGE, and *Air Power* magazines were received at the Standard Aircraft office in Elizabeth by President H. M. Mingle, Mrs. Mingle, Vice-President W. D. Judkins, Max J. Finklestein, H. B. Williams and other officers at 11 A. M.

After an informal reception, the guests were escorted through the extensive Standard factories viewing the various aircraft being constructed there. The six fast aero mail biplanes, equipped with 150 H. P. Hispono-Suiza motors, were then inspected. For the delectation of the visitors Pilot Gardner of the aero mail took up one of the Standard machines and performed several loops, side slips, figure eights, etc. When Pilot Gardner came down he expressed great approval of the ease with which the new machine man-

(*Continued on page* 1074)

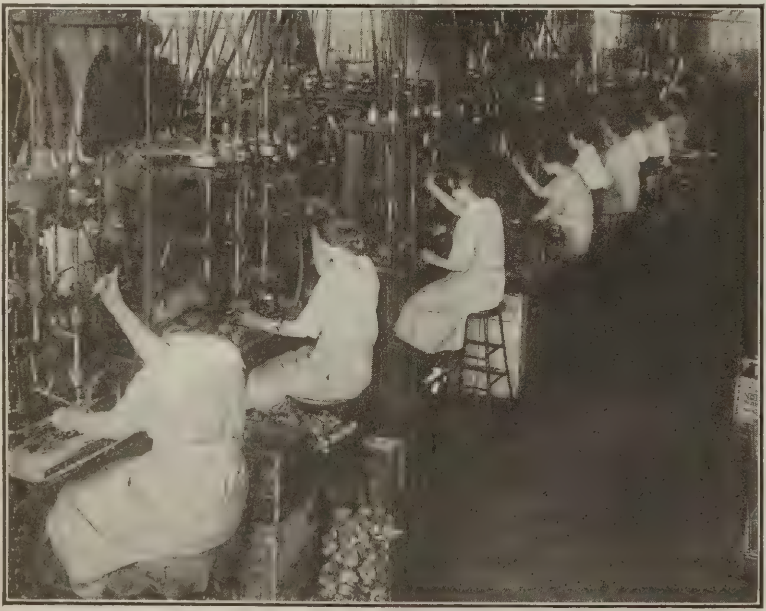
Heavy stamping press capable of punching and forming ½" steel

The working force numbers at present approximately one thousand.

The men are all skilled mechanics, either beyond the draft age or exempt on account of their value to the government in mechanical work.

Wherever possible in the minor lines of production, clerks, etc., female help has been employed, releasing the greatest possible number of men for army service.

In the Liberty Bond sales the workmen of this company have ranked high in the volume of bonds purchased in number and value in proportion to the number and income of the employees.



Multiple spindle drills working on aeroplane parts. Note the war time labor. Up to a year ago there had never been a woman on this floor

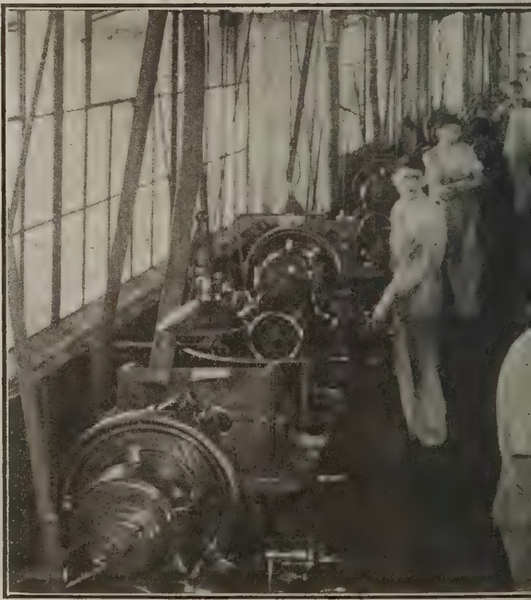
The Excelsior plant at Chicago, the home of t
inally designed for the efficient and economical pro
ticularly adapted to aeroplane work.

Their first undertaking in this line was the Excelsior-
tities with results far in excess of original expectations.

They are also producing a large volume of miscellan
perfection and workmanship.

The plant is a reinforced concrete structure six stori

Partial view of the aeroplane motor, timing and adjusting departm



Where the

xcelsior Motor Mfg. & Supply Co., which was orig-
on of the highest type of motorcycles, has proved par-

nce-Penquin motors, which they are now producing in quan-

aeroplane parts requiring the utmost degree of accuracy in

h, over 600 ft. in length and approximately 150 ft. in depth.

the Excelsior Motor Manufacturing and Supply Company of Chicago

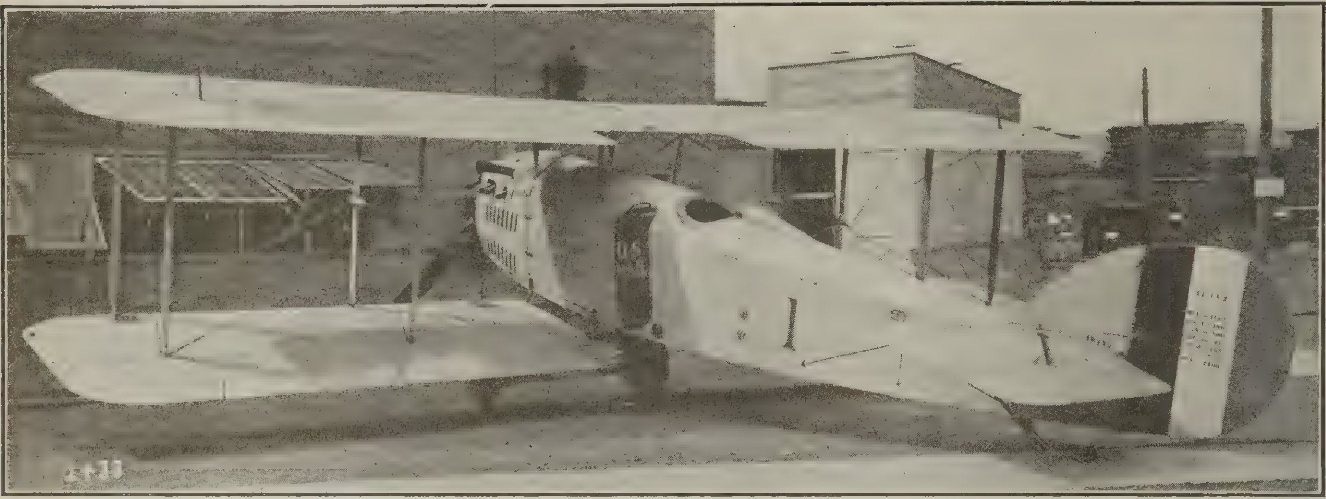
gs are ground

Testing aeroplane motor cylinder castings by air pressure

The mechanical equipment is the finest obtainable, including stamping mills for all classes of material up to one-half inch steel, enormous batteries of the latest milling machines, boring mills, engine and turret lathes, and automatic screw machines. There are also special departments devoted to brazing, welding, heat treating, enameling and plating.

The recognized quality of the Henderson and Excelsior motorcycles is ample evidence of the facilities of the plant and the government work now being produced is of the same high standard.

Aeroplane Motor Assembling Department



One of the six aero mail machines delivered or August 6, 1918, by President H. B. Mingle of the Standard Aircraft Corporation to the Honorable Otto Praeger, second assistant postmaster. It is equipped with 150 h.p. Hispano-Suiza Motor, weighs 1,600 pounds, will carry from 150 to 300 pounds of mail. Two of these machines flew from Elizabeth to Philadelphia in forty minutes.

(*Continued from page* 1071)

euvered and pledged himself to "no more stunts" while in the Postal Service.

An excellent buffet luncheon was then served in the spacious office and at two-thirty P. M. all repaired to the Grand Stand facing the Standard flying field. All the 5,000 employees of the factory and fully 5,000 spectators were present at the ceremonies.

President Mingle made a few remarks to the effect that he considered it a great honor for the Standard Aircraft Corporation to be able to deliver six aero mail machines to the U. S. Postal Department in addition to the aircraft of various types they were delivering to the War Department for the winning of the war. Mr. Mingle said he knew it was due to the fact that everybody in the Standard plant, from the office boy to the highest official, were working shoulder to shoulder in a "real fighting industry."

Hon. Otto Praeger was then introduced and said: "Already the aero mail service has been established between Washington, Philadelphia and New York and it has demonstrated its absolute need. It has confirmed our most cherished hopes of rapid transportation. The delivery of these new machines will, we hope, mean the further extension of the aero mail service, and let us remember that whatever contributes to improving the mail service, such as the aeroplane has done, has come to stay."

In introducing President Hawley of the Aero Club of America, Mr. Mingle said that the Aero Club of America had done more than any other organization toward educating the aeronautical public as well as the general public to the absolute necessity of establishing aero mail routes. Indeed, the Aero Club of America had been the first to advocate and the one to continually fight for the extension of the aero mail service.

President Hawley replied: "The Aero Club of America was founded in 1905, and from that date to this it has fought for the expansion of the aeronautical industry. Since 1911 it has advocated the establishment of aero mail routes between the principal cities of the country, and it has been instrumental in assisting the U. S. postal authorities in getting the necessary appropriations for aero mail routes. Ex-Congressman Murray Hulbert had done all in his power to get Congress to vote the necessary money.

"In commemoration of this auspicious event and on behalf of the Aero Club of America, I have the honor to present to the aviators, who are to fly these Standard aero machines to Washington, D. C., for delivery to the U. S. Post Office authorities, aviators' wrist watches." Mr. Hawley then presented beautiful wrist watches to Postmaster General Praeger, Captain Lipsner, Mr. Connor, Mr. Hartung, all postal representatives, "to keep time" on the following pilots, who also received watches: Max Miller, Maurice A. Newton, Robert Shank, Ed. V. Gardner.

President Mingle said that no event dealing with the establishment of aerial mail routes would be complete without a few words from Mr. Henry Woodhouse, Editor of *Flying*, who had consistently fought for aerial preparedness and the establishment of hundreds of aero mail routes. Mr. Woodhouse paid a well-deserved tribute to Postmaster Praeger, Captain Lipsner and other postal authorities.

"The winning of the war is the most important question confronting us to-day, and we, who have aided in the development of aeronautics from its infancy, are firmly convinced that the war against Germany will be won in the air! Your wonderful plant and your efficient workers in this plant will be one of the contributing factors and we congratulate the Standard Aircraft Corporation on the fighting machines which it has produced. You are a valuable asset to the cause of the Allies."

"We congratulate you also on the progressiveness which is evidenced by the six aero mail machines which stand before us, on the progress you have made towards demonstrating the commercial uses to which the aeroplane can be put. The aero mail is to be the backbone of the business of the aeronautic industry. The aero mail is the first commercial use to which the aeroplane has been put, but hundreds of other uses will be found for it in the coming years. We wish to say that the Aero Club of America and all our aeronautical publications will continue to fight, with you, for the immediate and further extension of our aerial mail service as a preparation of our fliers for service at the front, and when the war is over we hope to see hundreds of aerial mail routes all over this continent of America," etc., etc.

Captain B. B. Lipsner, Superintendent of Aero Mail Service, spoke as follows:

Captain Lipsner's Address

With the inauguration of the Air Mail Service on May 15, 1918, the aeroplane entered the commercial field.

It is not now a question of experimenting to determine the usefulness of aeroplanes as a commercial carrier. The Air Mail Service is a success, operating without interruptions by weather conditions and carrying the mail by schedule.

The efficiency of the aeroplane for war service—both to furnish eyes to the army and for purposes of combat—has been demonstrated by daring feats. The aeroplane has developed marvelous efficiency as a fighting machine, its flights have outdistanced the flights of imagination. An atmosphere of romance and wonder attaches to being transported through the air among, through and beyond the clouds; to spurning the tedious meanderings of the earth's pathways; defying the laws of gravitation and reducing heights and distances to complete subjection.

But aeronautics are not food for the mere imagination. Transportation through the air is a practical mechanical proposition. The utility of the aeriplane as a medium of commercial transportation is established. We pass from poetry to mathematics. The utilization of power with the least possible wastage of lifting energy in carrying the weight of the engine; the details of construction and the consumption of fuel are things which attract our attention. Experimentation is not directed toward determining our ability to fly, but towards mechanical devices and improvements in construction relative to stability, reliability and expense of operation.

The air mail route is the first step towards the universal commercial use of the aeroplane. All the problems involved in perfecting the commercial utility of the machine are being worked up and exact records are being kept even to the most minute details of construction; and experiments are being made in the development of devices to meet various conditions to be encountered in air traffic.

The Air Mail Service is the mechanical laboratory for the advancement of commercial aviation. The wonderful acrobatic feats necessary to aerial combat are not a feature of the flying in this service, but in their place is the necessity to make ordinary flying commonplace and to do every day common-place things efficiently. The spirit of adventure is curbed down to the exactitude of routine performance. The system of the air mail service provides for a record of performances, not only of the aviator, but of the machine; not only of the machine as a whole, but as to each of all its parts. The efficiency and defect of every part of every machine are tabulated in the record. Defects discovered are corrected. The cost of maintenance and operation are tabulated in the record and every opportunity for economy in these is noted and availed of. The consumption of fuel and the frequency of cost of repairs is carefully recorded. This record is being kept with great exactness as to every detail, showing the performance of every machine and of all its parts. The value of this is easily comprehended by you gentlemen, and you will appreciate the importance of the air mail service to the manufacturing industry of aeroplanes when you are told that this record will be available to all of you. The tests and experiences tabulated may serve to avoid the duplication of defects and continuation of errors which may be disclosed by the test of practical experience in an exacting daily transportation service.

The air mail service should have a value to the aeroplane industry corresponding to the service performed to the farmer by the Agriculture Department in accumulating information relative to operation; and in the preliminary stages of development in commercial aeronautics it would be to the aeroplane industry what the Navy has been to the steel shipbuilding industry—it will supply the incentive for construction along commercial lines after the demand for war machines no longer exists.

President Mingle then presented U. S. flags to each of the aviators. Mail was stamped on the field by Postmaster Morris of Elizabeth for Washington, D. C. Still and moving pictures of guests and officers were taken. The aeroplane engines were started, the planes took wing like eagles to their destinations. Word was later received that the machines reached Philadelphia in 40 minutes.

The guests who signed the register were: Hon. Otto Praeger, Second Assistant Postmaster General; J. A. Edgerton, Purchasing Agent; G. L. Connor, Chief Clerk to the Second Assistant Postmaster General, and J. B. Corridon, Superintendent Railway Adjustments; Captain B. B. Lipsner, Superintendent Air Mail Service, and Edward V. Gardner, aviator in the postal service; Mr. Alan R. Hawley, president Aero Club of America; Mr. Henry Woodhouse, vice-president Aerial League of America and editor of *Flying;* Mr. August Post, secretary of the Aero Club of America; Captain Robt. Bartlett, U. S. A. T. S.; Captain Frederick Libby, U. S. Aviation Service; Mr. Evan J. David, business manager of *Flying;* Mr. Leroy Gulotta, editor of *Air Power;* Thomas H. Wheless, Newark, N. J.; Walter C. Burton, Postmaster, Brooklyn, N. Y.; Wm. F. Barry, Postmaster, Elizabeth, N. J.; J. B. Corridan, Washington, D. C.; James C. Edgerton, Washington, D. C.; Henry Givan, Glen Ridge, N. J.; Walter J. McTudor, New York; E. C. Duncuff, New York; F. J. Carroll, Elizabeth, N. J.; John F. Sinnott, Postmaster, Newark, N. J.

The specifications for the planes called for a speed of 100 miles an hour and a climbing capacity of 6,000 feet in ten minutes, with a capacity of 300 pounds of mail. The staff of mechanics who will maintain the equipment are now at the factory of the Wright-Martin Corporation, New Brunswick, N. J., where the Hispano-Suiza Motor is manufactured, for observation of the latest developments in this industry. The expert riggers of the postal service have been detailed to the aeroplane factory for a detailed study of the construction of the Standard planes. The postal aviators who will carry the mail on the Washington-New York route are expert fliers and instructors in aviation.

The list comprises Max Miller, former flying instructor at San Diego, Cal., 1,000 hours in the air; Maurice A. Newton, Brooklyn, N. Y., experimental flier and instructor, 1,100 hours in the air; Robert Shank, military flying instructor, Dallas, Tex., 1,200 hours in the air; Ed. V. Gardner, advanced flying instructor, Dallas, Tex., 1,400 hours in the air; V. P. Hollingsworth, military flying instructor, Dallas, Tex., 1,000 hours in the air. Reserve fliers, E. Leroy Langley and L. B. Boldenweck.

The transfer of the flying operations of the Air Mail Service is now under way, with a view to taking over the service by the Post Office Department at the close of flying on August 10th.

Second Assistant Postmaster General Praeger has authorized the following statement of appreciation by the Post Office Department of the work of the War Department in inaugurating the Air Mail Service:

The Army has kindly undertaken to teach us the rudiments of aviation by operating the Air Mail Service until such time as the Post Office Department could obtain equipment and organize its personnel.

With the aeroplanes which the Standard Corporation has just constructed, and the planes which the War Department is about to turn over to us, together with the continued cooperation of the great fighting and technical branches of the Government, the Postmaster General is in a position to relieve the Army within a few days of the burden of operating the Air Mail Service, which it has so generously undertaken and has conducted with conspicuous success.

Much as the Army has done toward establishing a dependable daily aeroplane mail route, the Post Office Department expects to do a great deal more, building as we will upon the splendid foundation thus laid down for us.

We have no illusion as to the possibilities as well as the limitations of the present-day aeroplane. Carefully kept records on nearly 30,000 miles of cross-country work, no little of it in fog, or rain, or hail, has given us a clear idea as to what we have a right to expect of the aeroplanes now available for mail purposes. The future prospects of the Air Mail Service loom big before us. Mechanical difficulties no longer stand in the way of an immediate far-reaching expansion of the air mail, but no extension of that service will be undertaken without due regard for the War demands on our aircraft industry and personnel. Therefore its extension at this time will be gradual and always in fullest harmony with those charged with responsibility for the conduct of the War.

The Post Office Department is being besieged with proposals to operate air mail routes in various parts of the country. It is only fair to those proposing to finance air mail carrier corporations to state that at this time no extension of the Air Mail Service has been determined upon, but that looking to the future the Post Office Department is giving consideration to the operation of a daily aeroplane mail route between New York and Chicago, which would cut in half the time between the two greatest cities of the United States and bring the entire West, even to the Pacific Coast, 12 hours closer to New York and the Atlantic seaports.

Although our chief work lies ahead of us, we are proud of what has been accomplished during the past two and a-half months. During June we flew 96 out of a possible 100 legs of the air mail route between Washington and New York, with but 8 forced landings. In July we flew 106 out of a possible 108 legs of the route with but 8 forced landings. There are no surer or more courageous fliers in France than the five Army officers who put the Air Mail Service on the map through their work in fog, rain and hail.

When the fast aeroplanes which have just been completed are delivered to us, the Postmaster General will take over from the military authorities the flying operations of the air mail with a picked organization of aviators and mechanicians, full of confidence as to the future and with gratitude to the Army for what it has done for us and what it has taught us.

Monthly Report of Operation and Maintenance

UNITED STATES POST OFFICE AERO MAIL SERVICE

MAY 15-31, 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS		HANGAR MEN		MECHANICS		Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND COST UNIT					
							Actual time	Dead time	On plane	Miscellaneous	On plane	Shop time					Gallons of Gasoline	Total time run .min	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
37944	$15.75	$2.71	$11.73	$12.40	$22.06	$2.66	$26.68	$21.73	$8.35	$9.72	$102.20	$9.72	$ 9.77	$27.56	$16.66	$299.70	62	7 19	550	8.88	$40.96	$.5449
38262	20.32	4.79	11.73	12.40	22.06	2.66	16.92	21.73	1.99	9.72	21.87	9.72	125.50	27.56	16.66	325.63	71	11 56	239	3.38	27.28	1.3624
38274	75.13	21.83	11.73	12.40	22.06	2.66	73.32	21.73	2.00	9.72	140.12	9.72	11.05	27.56	16.66	457.69	258	19 50	1365	5.29	23.08	.3353
38275	77.49	25.48	11.73	12.40	22.06	2.66	68.70	21.73	1.87	9.72	167.05	9.72	142.72	27.56	16.66	617.55	262	19 24	1247	4.75	31.83	.4952
38276	54.57	10.22	11.73	12.39	22.06	2.66	66.30	21.73	1.87	9.72	152.43	9.72	27.89	27.56	16.66	447.51	185	15 40	1024	5.52	28.56	.4370
38278	73.83	20.48	11.73	12.39	22.06	2.66	96.25	21.73	18.07	9.72	352.47	9.72	51.78	27.56	16.66	747.11	245	26 40	1719	7.01	28.01	.4346
39365	27.90	5.58	11.73	12.39	22.07	2.66	14.54	21.74	6.73	9.72	68.98	9.72	5.42	27.56	16.66	263.40	93	3 00	280	3.01	87.80	.9407
39366	37.50	2.50	11.73	12.39	22.07	2.67	23.42	21.74	3.49	9.73	90.06	9.73	16.52	27.56	16.66	307.77	125	6 28	540	4.32	47.59	.5699
39367	22.80	4.28	11.72	12.39	22.07	2.67	13.27	21.74	1.87	9.73	34.97	9.73	4.22	27.57	16.72	215.75	76	2 51	270	3.55	75.70	.7990
Totals	$405.29	$97.87	$105.56	$111.55	$198.57	$23.95	$399.40	$195.60	$46.21	$87.50	$1130.15	$87.50	$394.87	$248.05	$150.00	$3682.11	1377	113 8	7234	5.25	$32.54	$.5090

Note.—Depreciation is not estimated in this report, for lack of convincing data, but is reflected in the items under repairs, parts and labor.

Items for rent, light, power, etc.; misc.; dead time of pilots; time of hangar men, mesc.; shop time of mechanics; interest on investment; and departmental overhead charges; all of which are not directly apportionable to individual ships, are pro-rated equally between all of the ships.

FOREIGN NEWS

FRANCE

The French official contains the following:

"During the fighting on July 28th and 29th the Allied aviators were active along the whole front of the battle between the Aisne and the Marne.

"On July 28th French and British bombing planes dropped over twenty tons of projectiles upon cantonments and roads in the Ardre and Vesle Valleys, and upon railroad stations and military objectives in the same region. On July 29th and the following night thirty-six tons of bombs were dropped, fires and explosions being caused.

"On July 30th Franco-British air squadrons brought down or put out of action eighteen enemy aeroplanes and set on fire one captive balloon."

GREAT BRITAIN

The aviation announcement on July 22 by the British Air Ministry says:

"July 21 the very strong west wind and low clouds almost entirely prevented flying except on a small part of the front. The machines in this sector dropped bombs on various targets, including railway stations, where a direct hit was obtained on an ammunition train.

"In combats five hostile machines were brought down. Four of our machines are missing.

"After dark the sky cleared and the wind dropped considerably, enabilng our night bombing machines to carry out raids on the greater part of the front. Thirteen tons of bombs were dropped on the railways at Seclin, Menin, Lille and Cambrai. One machine has not returned."

The official statement on aerial operations issued on July 23 says:

"In a raid carried out on the afternoon of the 22d instant the main station of Offenburg (Baden) was hit and bursts were seen on the sidings. One hostile machine was destroyed. All our machines returned.

"On the night of July 22-23 repeated attacks, attended with good results, were carried out against the enemy's aerodromes. Fires and explosions were observed. Other targets were engaged with bombs and machine gun fire."

Further details of the raid on Tondern, Schleswig, prove that the results were better than was at first believed. The early reports said only two Zeppelin sheds with the airships inside were destroyed. Later information is to the effect that a bomb was dropped on a flat building, built partly underground, and that from the nature of the building and the violence of the explosion it presumably was a magazine.

The British official communication dealing with aviation issued July 25, follows:

"On the 24th instant there was still a very strong west wind blowing and the weather mainly was overcast. Toward evening the sky cleared and a certain amount of sharp fighting and bombing took place.

"Fifteen hostile machines were brought down and three driven down out of control. Three of our machines are missing.

"During the night over twenty-four tons of bombs were dropped by us on the railways at Valenciennes, Seclin, Courtrai and Armentieres and on hostile billets on different parts of the front. Two trains were hit with bombs and thousands of rounds were fired from machine guns at various ground targets, including active anti-aircraft guns, searchlights and transports.

"All our machines returned. One of the enemy's night bombing machines was brought down in our lines by anti-aircraft gun fire."

The British Air Ministry reported on July 26th:

"On the 24th instant there was still a very strong west wind blowing and the weather mainly overcast. Toward evening the sky cleared and a certain amount of sharp fighting and bombing took place.

"Fifteen hostile machines were brought down and three driven down out of control. Three of our machines are missing.

"During the night over twenty-four tons of bombs were dropped by us on the railways at Valenciennes, Seclin, Courtrai and Armentieres and on hostile billets on different parts of the front. All our machines returned.

"One of the enemy's night bombing machines was brought down in our lines by anti-aircraft gunfire."

London.—The communication dealing with British aerial operations in France issued July 27th reads:

"On the 26th inst., during the short period of the day in which flying was possible, three enemy machines were brought down by our airmen and a hostile balloon was shot down in flames. Two of our machines are missing.

"One of our machines, reported as missing on the 25th, has since been located."

Reporting military operations on the British sector of the Austro-Italian front, a War Office statement issued July 29th says:

"In the past week the situation on the British front was quiet. Six hostile aeroplanes were brought down. Two of ours failed to return."

The following official communication was issued on July 30th by the Air Ministry:

"On the night of the 28th-29th our machines attacked the railway stations at Offenburg, Rastatt and Baden. Stuttgart and Sollingen also were attacked. Three hostile aerodromes and numerous ground targets were bombed, and subjected to machine-gun fire. All our machines returned."

On July 29th ground mist and low visibility interfered with artillery observation, but our bombing and fighting machines carried out their usual work. Eleven tons of bombs were dropped on enemy dumps and billets and fourteen hostile aeroplanes were destroyed, with the loss of two of our machines.

During the night, in spite of unfavorable weather conditions, bombs were dropped by us on Bray and Bapaume. All our machines returned.

"On the morning of the 30th instant our squadrons successfully bombarded the railway station at Offenburg. Good results were obtained. In the course of combats three enemy machines were shot down and one other was driven down out of control. One of our machines is missing."

"On July 30th haze and a ground mist again interfered with observations, but nevertheless a large number of photographs were taken by us and more than eleven tons of bombs were droppen on enemy sidings and dumps.

"Rather more enemy machines were encountered, fifteen being brought down and six being driven down out of control. Six of our machines are missing.

"During the night of the 30th two tons of bombs were dropped by us without losses. In addition to those already reported, a hostile machine was shot down by infantry fire on the 29th instant."

The official communication on aerial operations says:

"On July 31st heavy fighting took place in the air, with the result that twenty-six enemy machines were brought down and nine others were driven down out of control. Four of our machines failed to return.

"Although observation was again difficult, many photographs were taken and fifteen tons of bombs were dropped by us with good effect. During the night over twenty-three tons of bombs were dropped by us without the loss of a machine.

"Several railways, including those at Cambrai and Lille, suffered very heavily, many direct hits being obtained and a number of large fires started."

"On the morning of the 1st of August one of our bombing squadrons started to bomb Cologne, but, finding it enveloped in a cloud, turned and dropped its bombs on the factories at Duren (Rheinish Prussia), in one of which a fire broke out. All our machines returned.

'A second formation attacked the railway workshops at Treves. They were heavily attacked by large numbers of hostile machines. Three of the enemy machines were destroyed. One of our planes has not returned."

A communiqué referring to operations on the Italian front says:

"In the month of July sixty-six hostile aeroplanes were destroyed and three were brought down out of control. Four of our machines failed to return."

GERMANY

"The official statement from German general headquarters on July 31st says:

"Yesterday we shot down nineteen aeroplanes.

The following official report was issued August 1st:

"The enemy lost on the front yesterday twenty-five aeroplanes in air fights and from gun fire from the ground.

"Further, a British squadron of six big battle planes on its way to raid Saarbrucken was destroyed by six of our machines before it was able to drop its bombs. We shot down another British battleplane out of the second and following squadrons."

ITALY

The Italian war office reports the destruction of thirteen hostile aeroplanes on July 29th and five on July 30th.

Eleven enemy aeroplanes were brought down by the Italians on the front in northern Italy on July 30th and raids were made by planes which bombarded enemy railroad plants, according to an Italian War Office statement received from Rome.

TURKEY

Six aeroplanes dropped bombs on Constantinople on July 27th, according to a Turkish official report. Five persons were wounded.

Half a ton of bombs were dropped on the city on July 7th by British aviators.

Star British Flier Lost

London.—Major Edward Mannock, one of England's most successful flying men, who had 58 German machines to his credit up to a month ago, is missing, according to *The Evening Standard*.

Burning Zeppelin Falls on Dutch Soil

Amsterdam—A Zeppelin fell in flames at the German frontier near Dalheim on July 15th, the *Rotterdamsche Comant* announces.

Eddie Rickenbacher Cited in French Orders

Columbus—Lieutenant Edward V. (Eddie) Rickenbacher, former well-known American automobile racer and now an ace in the United States aviation service in France, has been cited for bravery by the French Government.

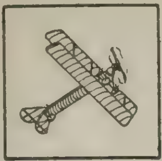
His mother, Mrs. Elizabeth Rickenbacher, of this city, received the citation on August 2 in the form of a steel engraving, signed by General Gerard of the French army. The citation was awarded for the sending down in flames of an enemy aeroplane.

Flew from Front to England, Took Oath as M. P., Flew Back

London, July 31.—According to *The Morning Post*, Major Gen. Davidson, who has been elected for the Fareham Division in place of Lord Lee, left general headquarters in France yesterday morning, came to England by aeroplane, motored from his landing place to Westminster, took the oath and sat in the House of Commons a while.

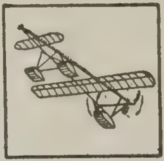
Then he went back as he had come and was probably on duty again, while the House was still talking about national shipyards.

He was anxious to take his seat before recess, could get only a few hours off, and there was no other way to come.



MODEL NEWS

Edited by John F. McMahon



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
99th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Model Aeroplane Building as a Step to Aeronautical Engineering

Before attempting to build the Scale Model Curtiss J N 4-B shown in the accompanying drawings, I would advise the model builder to construct a full size drawing from the dimensions I have given. A full size drawing would save time and trouble and each part could then be cut to the exact length before assembling, which would save considerable work in constructing the model. Without a drawing the model builder would have to cut each part and then attempt to fit it in the machine with the result that it would be the wrong shape or size and another part would have to be made.

To construct the model proceed as follows: lay out each side of the fuselage first. Care must be taken when cutting the longerons. The fuselage you will notice is 22⅞" long, but the longerons are curved and of course should be ¾" longer to allow for bending. To bend, I would advise holding over a jet of steam emerging from a kettle and slightly straining until the proper shape is reached. If possible I would advise the model builder laying the drawing on a flat piece of wood and placing tacks along the outside edge of the fuselage lines and bend the longerons around these which would save time, give the correct shape, and insure against the snapping of these members. When shaped put the struts in place and fasten by applying a little glue to the end of the strut and then use a very small nail to hold in place. It may be necessary to drill a small hole to guard against the splitting of the wood.

When two sides are finished put in the top and bottom struts. The plan of the top and the bottom of the body is shown at the lower left of the drawing. The model builder will notice that the top struts are shown clearly and the bottom struts are supposed to come directly underneath the top, except where the struts are shown by dotted lines, these are bottom struts and are placed to take care of the slant of the wing side struts.

Next make the motor stick which consists of a special shaped fitting at one end and a hook for fastening the rubber at the other (I may mention that all the fittings such as propeller shafts, wheels, struts, sockets, wood, bamboo, etc., used in this and all the models following, may be purchased from a Model Supply House. I have just received a very complete catalog from the Wading River Manufacturing Company, 609 Broadway, Brooklyn, N. Y., which has just been revised and if model builders do not care to wait for the drawings in Aerial Age they may secure the full drawings of a Standard Curtiss J N 4-B from this Company).

To complete motor stick place a ball bearing propeller shaft in the fitting at the front of the machine. I would advise fastening the motor stick in two places only and about two inches apart at the front of the machine. This is best, because when rubber is twisted to give power to the propeller it has a tendency to twist the motor stick, and if this was fastened all along the body it would twist the body out of shape.

The landing chasis is made of ¼ x ⅛" wood cut to the lengths specified after which they must be made to a streamline shape. I would advise making little plates of thin brass to fasten the struts together and also to fasten the struts to the fuselage, but if the model builder thinks he could do the work better some other way he is at liberty to do so. The axle is a regular 6" x ⅛" Brass axle and the wheels 2" in diameter. After placing landing chassis fittings in place on the fuselage, place a wing strut socket directly over it, to take the wing spars when we will finish them.

The "Turtle Deck" over the body is made of a few strips of thin wood as shown at the lower right of the drawings. The half round pieces are then drilled out for lightness as shown. The strips of wood are merely laid over the formers and fastened with glue. This portion is put in place only to preserve the streamline of the body and should be made as light as possible.

The portion where the pilot and observer are supposed to sit is made of thin aluminum, holes being cut to represent the cockpits. This part is fastened to the end of the motor and the "Turtle Deck" by small nails.

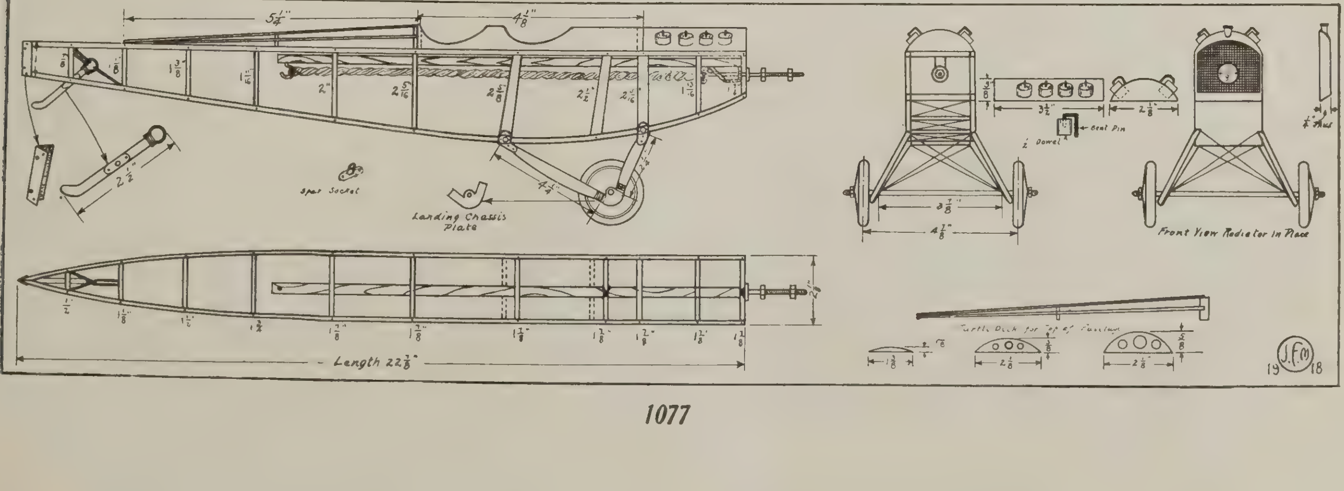
The motor is made from a piece of wood shaped to a half round section, holes being drilled to take the imitation cylinders which are made of pieces of dowel sticks with a bent pin inserted to represent valve push rods. Paint the cylinders and engine cover with aluminum paint.

The Radiator is also made of wood. The outside or imitation casing is painted aluminum, the inside having vertical and horizontal lines of black paint or ink as shown. When finished drill a hole, as shown, to admit the propeller shaft to project.

The tail or rear part of the machine should be kept as light as possible without sacrificing strength because we must keep the centre of gravity of the model as far forward as possible to make the machine exactly to scale. This is the main reason I have limited the length of the motor stick.

In the next article we will build the wings.

(To be continued)



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield. Ohio.

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to O. i/c Fisher Body Corp., Detroit, Mich.
Note 3—Report to C. O., Cristobal, Canal Zone, Panama
Note 4—Report to Recruit Receiving Station, Fort Wayne, Mich.
Note 5—Report to Chief Inspector, Akron, Ohio.
Note 6—Report to Camp Sherman, Ohio.
Note 7—Report to C. O., Aberdeen, Md.
Note 8—Report to O. i/c Dayton-Wright Aeroplane Corp., Dayton, Ohio.
Note 9—Report to Dis. Mgr., Aircraft Production, 480 Lexington Ave., N. Y. C.
Note 10—Report to Rubay Co., Cleveland, Ohio.
Note 11—Report to Fort Kamehameha, Honolulu, Hawaii.
Note 12—Report to aviation repair depot, Speedway. Indianapolis, Ind.
Note 13—Report to Signal Corps Camp, Fort Leavenworth, Kans.
Note 14—Report to Union Switch and Signal Co., Swissvale, Pa.
Note 15—Report to Col. J. G. Vincent, Dayton, Ohio.
Note 16—Report to Dis. Mgr. Production, 400 Lexington Ave., N. Y. C.
Note 17—Report to Army Balloon School, Lee Hall, Va.

Special Orders Nos. 164—169, Inclusive

A

Aehle, Truman H.	DIK
Atwater, Allen Russell	SLA; DAP
Adler, Elmer Edward	FLA; DAP
Ailsworth, Richard E	DIK
Appleman, Earl	TFT
Adams, Chester A	FRF
Arthur, William Hamilton	SLA; BPT
Alexander, Paul	SLA; CGC
Atkins, Charles M., 3rd	MAC
Adams, Carlisle Gilliam	SLA; CGC
Ainslie, Walter M	BST
Ambrose, John Leftin	SLA; EOT
Ayars, Milbert P	EOT
Aldridge, William S	EOT
Aven, William R., Jr	EOT
Allen, Leon B	TFT
Aschenbrener, Randolph Alois	SLA; PFO
Applequest, Jerome Anthony	SLA; Note 14
Aub, Anthony W	Note 4

B

Barre, Martin Luther	SLA; PFO
Baird, Andrew	SMM
Blunk, Adolf	SMM
Brant, Gerald C	DMA
Brown, Ernest Levi	SLA; CFT
Baker, Earnest B	SMM; FRF
Baisley, Herbert K	FRF
Bastow, Joseph G	FRF
Berger, George Reis Bart	SLA; DAP
Burrage, Albert Cameron	FLA; DAP
Brown, James Henry	FLA
Bryant, Daniel Joseph	SLA; CFT
Brissell, Willard S	TFT
Baker, Frederick Amos	CPA; DAP
Blue, Harry N	FRF
Brooks, Hugh	FRF
Brubaker, Lawrence	EOT
Brocke, Leon Charles	SLA; BFT
Bouquet, Uric L	EOT
Busk, Stephen L	DIK
Blake, George E	TFT
Browne, Lucien W	DIK
Butner, John C	SMM
Birks, George Raymond	SLA; FOB
Baker, Gordon	FRF
Buchanan, Wallace E	DIK
Bourman, Charles A	DIK
Bouligny, Ralph H	CSO
Bingham, William Frederic	SLA; PFO
Bennett, Samuel C., Jr	FLA
Blackler, Perry Wells	SLA; SBI
Barrett, Arthur E	DIK
Booth, Lyman	DIK
Brennan, Edward W	DIK
Brenton, Walter	DIK
Buford, Bennett G	DIK
Birch, Charters Ward	SLA; SBI
Berkin, Jay J	SLA; CGC
Burroughs, William M	TFT
Blackburn, Daniel M	TFT
Baukat, James G	TFT
Buswell, Walter S	SLR; DIK
Brosnan, Hugh Murphy	SLA; EOT
Braun, Milton Frank	SLA; CRI
Beymer, Oliver Herbert	SLA; PFO
Beil, Richard Maybeck	SLA; GLC
Bartley, James Goss	CLA; CGC
Barker, Charles Morse	SLA; GLC
Brown, Fred Yates	SLA; CGC
Busher, Julius Eugene	SLA; CGC
Bagby, Charles Todd, Jr	SLA; CGC
Benedict, Maurice T	DIK
Benson, Hardy M	DIK
Bible, Dana X	DIK
Brown, George R	DIK

Burdick, Harold B..........DIK
Batzle, Louis John..........WAC
Bancroft, Winthrop..........Note 17
Breckinridge, Ban J..........WFO
Baker, Joseph S..........SMM
Bridges, Kenneth L..........DIK
Butler, Ben I..........DIK
Boyd, John P..........Note 2

C

Cutler, Clarence Meredith..........SLA; SBI
Cavagnaro, James F..........TFT
Clarke, Thomas Augustine..........SLA; DAP
Crom, George Curtiss, Jr..........SLA; PFO
Congdon, James Russell..........SLA; PFO
Casebolt, Kirby Quentin..........SLA; DAP
Chalifoux, Harold Leufroi..........FLA; DAP
Collins, William F..........FRF
Clark, Harold M..........DMA
Chambers, Karl D..........DMA
Chapman, William B..........FRF
Coleman, Robert Henry..........SLA; SBI
Creedon, John Henry..........SLA; SBI
Canady, Earl L..........DMA
Christensen, Ezra A..........DIK
Carmichael, Amos E..........FRF
Curtis, Erland L..........DIK
Carmine, John W. S..........TFT
Cook, Frank F..........DIK
Cooper, Francis J..........DIK
Carlton, Henry F..........TFT
Cowen, Edward G..........SMM
Copeland, Jay Milton, Jr..........SLA; SBI
Crouch, Lloyd Henry..........SLA; RSD
Crowell, Robbins P..........FRF
Carryl, Frank M..........LHV
Crane, Sheldon Cyr..........SLA; CGC
Crossan, Spruille Burford..........SLA; CGC
Chatterson, Marshall Cragg..........SLA; KST
Converse, Julian Langston..........SLA; EOT
Cassidy, Holland M..........DMA
Cox, Arthur S..........FRF
Cochran, Robert B..........DIK
Clawson, Harry O..........DIK
Crumley, Charles L..........SMM
Carlson, Frank N..........EOT
Chaplin, Winthrop L..........EOT
Chester, Andrew E..........EOT
Cleveland, Waldo A..........EOT
Collier, Henry L..........EOT
Cornell, George C..........EOT
Couberly, Lawrence B..........EOT
Craig, William W..........EOT
Cover, Carl Anson..........SLA; KST
Clark, Reuben G..........KST
Chase, Samuel W..........DIK
Chapin, Charles G..........CGC
Condit, Paul Grandin..........SLA; CGC
Clarke, Howard Reginald..........SLA; CGC
Collins, Lyman Irving..........SLA; Note 7
Connell, Samuel M..........Note 8

D

Dillaway, Manson M..........TFT
Dixon, Richard H..........DMA
Davis, Paul Adams..........SLA; RSD
Dapron, Fayette A..........DMA
Davidson, Kenneth S..........TFT
Drescher, Herbert..........TFT
Dudley, Chester P..........FRF
Denny, Joseph Johnson..........SLA; DAP
Dougherty, James E..........SMM
Dyche, Justin K..........FRF
Daly, George Sylvester..........DIK
De Arce, Leroy P..........TFT
Dickey, George Leon..........SLA; SBI
Dawson, Thomas Edward..........SLA; CRI
Des Champs, James W..........DIK
Dunn, Walter V..........TFT
Dougherty, James..........FRF
Dresser, Burtis E..........CAF
Delashmutt, Harry A..........PFO
Dion, Elzear Nicholson..........SLA; CGC
Drane, Hayward Benton..........SLA; CGC
Duryee, Andrew B..........FLA; DMA
Davidson, Carleton F..........EOT
DeGroot, Horace E..........EOT
Delany, Russell W..........EOT
Douglas, David D..........DMA
Doherty, James F..........DMA

E

Estep, Edwin Ralph..........FLR; DMA
Emerson, Sumner B..........FRF
Ettenger, Edwin Lloyd..........SLA; SBI
Eddy, Arthur E..........CGC
Eliason, Carl Grammer..........SLA; SBI
Earley, Charles Augustine..........SLA; SBI
Epp, Otto C..........TFT
Evert, Paul..........FRF
Endress, Clarence Henry..........SLA; PFO
Ennis, Arthur Ignatius..........SLA; EOT
Emerson, Sigard A..........Note 8
Emery, William Harrison..........SLA; SBI
Erickson, Robert..........SLA; LDT
Ekblom, John Olaf..........SLA; SBI

F

Fleischman, Max C..........DMA
Frank, Walter H..........FRF
Fountain, Ray C..........FRF
Finter, Clyde V..........CGC
Frazier, Edward J..........EOT
Fountain, Roy C..........SMM
Fluer, Peter E..........DIK
Farrar, Delwin B..........TFT
Fisher, Floyd C..........DIK
Freeman, Orville B..........DIK
Franklin, John A..........TFT
Fulwilder, James Henson..........SLA; AAD
Foster, Lindsay B..........EOT
Fleming, Carl S..........SLR; DIK
Fairfield, Edward M..........LHV
Fawcett, Richard Hartshorne..........SLA; SBI

G

Galentine, Norman Eddy..........SLA; FOB
Grose, Ronald..........SLA; CFT
Gleaves, Richard D..........FRF; SMM
George, Jesse Warren..........SLA; SBI
Greene, Charles Carroll..........SLA; SBI
Grady, Anthony J..........DIK
Griswold, Clifford B..........TFT
Gravely, William S..........EOT
Graves, Gilbert S., Jr..........FRF
Garrison, George C..........EOT
Grethen, John P..........SLA; CRI
Garretson, William Voorhees..........SLA; SBI
Garman, Stanley Cortland..........SLA; CGC
Grover, John H..........SAG
Guillemette, Joseph Dydime..........SLA; PFO
Guffanti, Alexander J..........FRF
Green, Warren K..........SLR
Gardiner, Chandler B..........DIK
Grimes, Carl Allen..........SLA; KST
Giblon, Earl Zenneth..........FLA; Note 9
Griffin, Howard P..........Note 2

H

Hull, Justus Miles..........SLA; BFT
Harris, Robert Fitton..........SLA; BFT
Hanchett, Frederick Williams..........SLA; BFT
Hammond, Fred R..........FRF
Hunt, Roy E..........GLC
Handwerk, Morris C..........SMM
Hayes, Martin A..........SMM
Hornsby, Aubrey..........FRF; SMM
Hughes, James B..........FRF; SMM
Heald, Robert Storie..........SLA; FOB
Husey, Clyde L..........RSD
Hangan, Alfred J..........EOT
Hirsch, Morriss W..........EOT
Heward, Harlan L..........CGC
Hart, William Clark..........SLA; BFT
Hanson, Archie M..........DIK
Hill, James A..........DIK
Hallberg, Lloyd Clarence..........SBI
House, Edwin J..........LHV
Henderson, Elmer J..........FRF; PFO
Harvey, Robert B..........PFO
Hogue, Mark C..........PFO
Henderson, Denny E..........DIK
Harris, Rudolph T..........SLA; EOT
Heise, John Irvin..........SLA; CGC
Harris, Alfred Richard..........SLA; EOT
Horn, Norman E..........FRF
Hastings, Edward R., Jr..........BST
Haworth, George W..........BST
Hanlon, William J..........PFO
Hawkins, Emin W..........PFO
Hillhouse, John G..........PFO
Holloman, Barrett W..........PFO
Howard, John W..........SLR
Hardy, Donald E..........SMM
Hait, Roswell N..........FRF
Hone, Charles N..........TFT
Hanson, Etanwood L..........TFT
Hersey, George F..........Note 5
Haden, Clifton James..........SLA; CGC
Harmon, Frank H..........PFO
Harsey, Wilmot B..........SLR; DIK
Hooker, Charles J..........SLR; DIK
Horne, George W., Jr..........CGC
Henderson, Hugh M..........DIK
Hanes, Harold F..........Note 2
Hunt, Spencer S..........Note 8

I

Ingraham, Forrest W..........TFT
Irwin, John Robert..........SLA; PFO

J

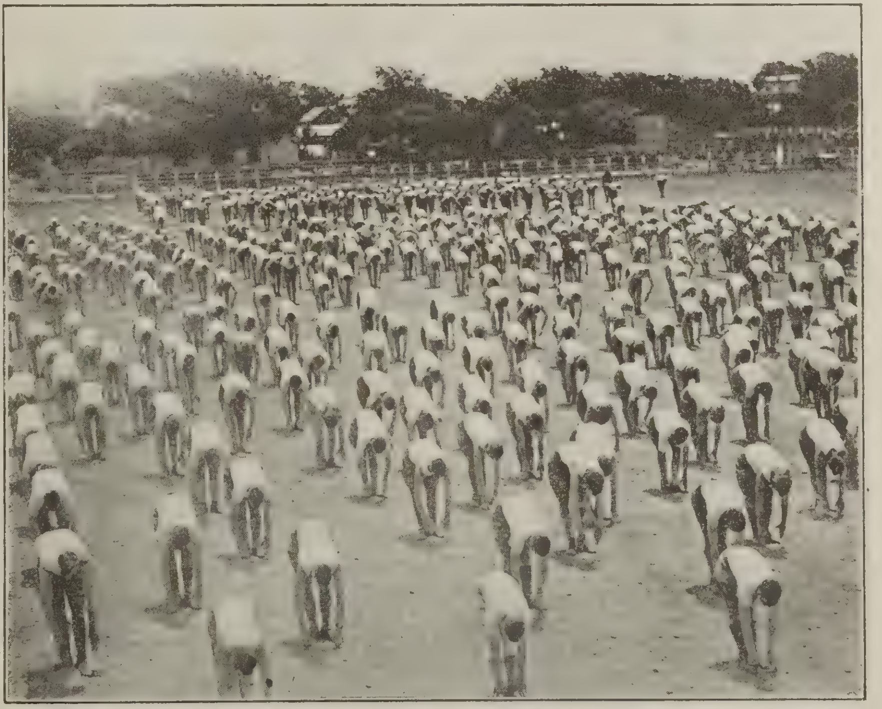
Jones, Roderick H..........DIK
Jones, Charles Alvin..........SLA; PFO
Jones, Clifford E..........TFT
Jones, Roy L..........DIK
Jones, Henry S..........GLC
Johnson, Charles C..........WFO
Johnson, Everett B..........FRF
Johnson, George T..........DIK
Jenkins, James W..........FRF
Jacobs, Arthur Ray..........SLA; PFO
Jenkins, Benjamin Francis..........SLA; BFT
Jones, Francis David..........SLA; SBI
Jackson, John Sidney..........SLA; GLC
Jackson, Karl Russell..........SLA; PFO

K

Kenely, John Charles..........SLA; DAP
Kelly, John H..........WFO
Keene, Charles W..........DMA
Kelly, John K..........CGC
Kent, Arthur Ogden..........SLA; CFT
Klinger, Kenneth P..........EOT
Krapf, George W., Jr..........KST
Kirkpatrick, George M..........DIK
Kingsbury, Orrin D..........SLA; SMM
Kerr, Frederick M..........FRF
King, Gelston T..........TFT
Kalkman, Eugene C..........EOT
Knowlton, George E..........EOT
Kirkpatrick, Everett L..........DIK
Kesling, Ernest E..........DIK
Kelly, Bernard E..........TFT
King, Lawrence Sprague..........SLA; BFT
Kelly, John O'Reilly..........SLA; CRI
Kernan, William F..........DIK
King, Harry C..........Note 8
Kelleher, Melvin B..........Note 2
Klemin, Alexander..........SLA; Note 15
Kincade, Franklin P..........Note 12
Knudsen, Herlef A..........Note 12

L

Lewis, Arthur R..........SLA; AAD
Lewis, Harold E..........FRF
Lippman, Frank E..........EOT
Leanhradt, Elmer G..........TFT
LaBoiteaux, Andrew J..........TFT
Lahti, Enoch Llmar..........SLA; DAP
Lachmund, Harry G..........TFT
Laird, Homer U..........SMM
Lindstrom, Ernest W..........TFT
Lindridge, Charles D..........CSO
Lycurgus, Presley Alexander..........SLA; DAP
Lucas, Ottis P..........SMM
Low, James B..........DIK
Larkin, George R..........TFT
Ledbetter, Thomas D..........FRF
Lawton, Edgar H..........FRF; SMM



Aviation cadets at their daily "setting up" exercise. This exercise is used throughout the Allied armies. It is very beneficial to the health and physique and its regular use will benefit any man. It is specifically designed to locate almost unknown muscles. This form of exercise is known throughout the service as "physical jerks." (Committee on Public Information)

Lamley, Russell Wayne............SLA; LDT
Lynch, Francis Joy..................SLA; RSD
Landreau, Norman Bayly..........SLA; EOT
Lievre, Joseph Benjamin............FLA; KST
Logan, David M.........................SMM

M

Mullin, Thomas Edward............SLA; PFO
Marshall, Charles H.......................SRC
Miller, Archie............CGC; WDM; Note 1
Malefski, Nathan...........................KST
Marks, Henry Gerson..............SLR; DAP
Miller, Euclid D..................FRF; SMM
Miskovsky, Robert J.......................SMM
Martin, William T..........................DIK
Mooney, Herbert R.........................EOT
Morgan, Harry R............................DIK
Maynard, Kenyon C.........................FRF
Metzger, Carlisle L.........................FRF
Morris, Hardin...............................FRF
Midcap, Clarence L.........................EOT
Miller, Eugene J.............................DIK
Martin, Douglas E...........................DIK
Mercer, Robert A............................DIK
Mitchell, Oliver F...........................CGC
Morgan, Marion Hewitt, Jr..........SLA; CRI
Mason, Ernest J..............................TFT
Monteith, Darrell M........................TFT
Murray, John D..............................DIK
Meyer, Edward...............................DIK
Miller, Frank M..............................TFT
Mueller, Ralph H.............................DIK
Morehead, Joseph H........................TFT
Milner, Paul C................................DIK
Moore, James Maxwell............SLA; GLC
Montgomery, Roe Floyd............SLA; LDT
Mooney, Clarence Bernard..........SLA; GLC
Mayer, August C....................SLA; CGC
Mabry, Harry C...............................SMM
Magill, James R..............................SMM
Morris, Charles W...........................SMM
Murphy, Charles C...........................SMM
Maxwell, Warren Arthur............SLA; KST
Miskell, James B.............................DIK
Merrill, Carlton H...........................MAC
Moss, Harry Stuart................SLA; CWT
Martin, John Halsey................SLA; KST
Martin, John Leonard..............SLA; CGC
Marsden, Ross Slyfield..............SLA; KST
Moll, Norman Louis.................SLA; CRI
Miner, Vern Edgar..................SLA; CAF
Merder, Parrish Davis..............SLA; CAF
Monsch, Sterling Raymond..........SLA; CAF
Morgan, Dwight Cadogan, Jr........SLA; TFT
Magee, Richard H............................BST
Miller, Colin U...............................BST
Moore, William R............................BST
Mountcastle, Paul............................BST
Miller, Robert L..............................FRF
Magee, Christopher.................SLA; TFT
Mohr, James H...............................EOT
Morgan, Daniel C....................SLA; CJS
Metzger, Carlisle L..........................TFT
Mehaffey, Carl A........................Note 3
Merrell, Cyrus W........................Note 5
Morrow, Karl C..........................Note 2

Mc

McCollough, John M.......................SMM
MacDonald, Russell Carrigan........SLA; BFT
McCullough, Charles B....................HHN
McCutcheon, James D............FRF; SMM
McCally, Ross L.............................CGC
McKeever, James L.........................DIK
McDougall, Kenneth........................TFT
McCaddam, Glen J..........................DIK
McDonald, Samuel F........................TFT
McKnight, James A.........................TFT
McLaughlin, John J.........................TFT
McIntosh, John Francis............SLA; CGC
McQuistion, Rolla Hunter..........CPA; DAP
McDonough, Andrew L......................DIK
McNott, James ....CUI
McPeak, Stanley.....................SLA; CGC
McCormack, Karl Newton..........SLA; KST
McKnight, Ewell.............................BST
McVickar, John B...........................TFT

N

Night, William J............................EOT
Nichols, Earl Brazil.................SLA; CGC
Nash, David M...............................FRF
Nash, DeLloyd D..................FRF; SMM
Norwood, George M.........................EOT
Nunenmacher, Francis W..................FRF
Nethercut, William R.......................SMM
Norgren, Nelson H..........................DIK
Nelson, Luther...............................FRF
Noyes, Linwood I...........................SMM
Northwall, Maurice E.......................FRF
Nelson, Clyde Keith.................SLA; CAF
Nilson, Edgar C..............................BST
Neuberger, Lawrence B.....................CGC

O

Overton, Robert E. L..............FRF; SMM
Owens, Sobieski B..........................CSO
Ormsbee, Harry S...........................DIK
O'Brien, Mattheu H.........................TFT
O'Brien, James H...........................SMM
Officer, Herbert George............SLA; GLC
Owens, John S...............................FRF
Oswald, Fred.........................SLA; GLC

P

Palmerlee, Joseph B.........................EOT
Payson, Randolph...................SLA; CRI
Powel, Harcourt.....................SLA; CGC
Packard, Harold A...........................SMM
Pinkham, Henry P...........................DIK
Powderly, Daniel W..........................DIK
Patton, Frank C..............................FRF
Peterson, Amos Gale................SLA; LDT
Palmer, Walter...............................FRF
Penland, Clifford H..........................EOT
Partridge, Clinton E.........................TFT
Patton, Frank C..............................SMM
Perry, Maurice Raymond............SLA; SBI
Prindle, William D...........................EOT
Pace, Floyd A.................................TFT
Pratt, Daniel H...............................DIK
Patton, Hilton M.............................CGC
Plaut, Leonard...............................DIK
Purcell, Lawrence J.....................Note 11
Price, George W.........................Note 17
Potosky, Walter David..........FLA; Note 10
Pinto, Peter Philip....................SLA; PFO
Park, James William.................SLA; TFT
Price, Walter Emmett...............SLA; GLC
Plosser, Joseph Benjamin...........SLA; GLC
Perry, William Radcliff......................DAP
Proctor, Willis H.............................FRF
Plantz, Edward Clune................SLA; GLC
Peterson, Helge A............................DIK
Pickney, Dunbar W..........................DIK
Penick, Mark A...............................DIK
Powell, James F..............................SMM
Peake, Junius B..............................SMM
Piper, Raymond A...................SLR; DIK
Pearson, Charles P...........................TFT

Q

Quinn, Thomas C.............................TFT
Quinnell, George C..........................DMA
Quimby, Elbert Whitney............SLR; GLC

R

Rowlinson, Walter S.........................DIK
Rivera, Reynaldo Jose..............SLA; BFT
Rosaire, Esme, Eugene.............SLA; BFT
Readio, Roger Frank................SLA; BFT
Rubel, Laurende Elias..............CPA; DMA
Rheinstein, Alfred............................RSD
Russell, Howard F...........................DIK
Roach, Howard L............................DIK
Rogers, Franklin L...........................TFT
Reyerson, Wallace E.........................DIK
Ristine, Richard H...........................GLC
Rich, Edwin Ewin....................SLA; CFT
Rittenhouse, Paul L.........................CSO
Riddle, Earl C................................TFT
Robinson, Clarence B........................EOT
Rose, Joseph W..............................TFT
Runkle, Charles C............................DIK
Ross, Joseph Hennessey............SLA; DMA
Rowe, Elmer Clayton................SLA; CRI
Rowe, Thomas John.................FLA; DAP
Robinson, Malcolm G........................FRF
Ranney, Lynn Anderson............SLA; GLC
Robinson, Hyman I..........................DMA
Roullott, John P..........................Note 2
Reitenbaugh, John S.....................Note 2
Rose, Waldo H...............................LHV

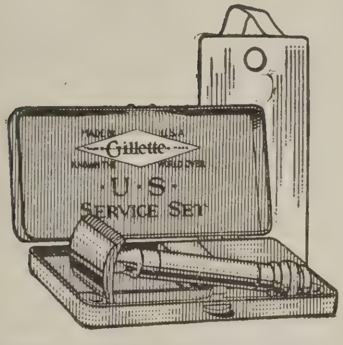
S

Sintzenich, Arthur Harold Cue.....SLR; SRC
Stewart, Ralph Berry................SLR; MSC
Schumacher, Charles H.....................FRF
Sanborn, Thor Warren..............FLA; VBW
Seward, Jackson Anderson..........SLA; CFT
Spivey, Lloyd G..............................SMM
Snyder, Laurence N..........................DIK
Swain, Francis W............................SMM
Saltsman, Irl L...............................CGC
Scott, Robert C..............................SMM
Smith, Clarence..............................DIK
Seawell, John L..............................DIK
Struby, Walter Vanderveen.........SLA; FOB
Steele, James J..............................SMM
Simon, Gerald H.............................DMA
Shaw, Donovan L............................TFT
Stitt, Donald G..............................FRF
Smith, Clarence A...........................DIK
Strange, Robert..............................FRF
Shea, Thomas Francis...............SLA; CFT
Stevenson, Norman M.......................DIK
Sansome, Frederick A.......................EOT
Steward, Wayne D...........................TFT
Sauls, Jesse W...............................TFT
Shillington, Waldo E.........................TFT
Scott, Ernest D..............................DIK
Sandlin, James H............................DIK
Spencer, George S......................Note 16
Smith, Glanton............................Note 6
Selts, William A.............................LHV
Seward, Jackson A...........................LHV
Shepherd, Herbert R.........................LHV
Setzler, Harry G.............................LHV
Stanley, Robert H............................LHV
Stinson, David R.............................LHV
Stone, Percy N...............................LHV
Stout, Minor W...............................LHV
Stutzman, Theodore.........................LHV
Strother, Samuel P...........................LHV
Sutherland, Alexander G....................FRF
Sweitzer, Leonard Edward..........SLA; PFO
Stauffer, John Littleton..............SLA; KST
Sloan, Abram L..........................Note 13

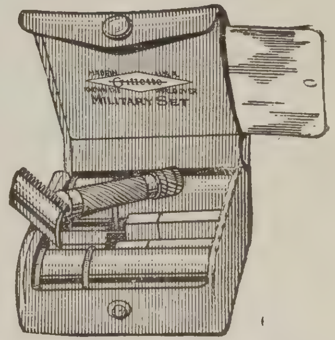
(*Continued on page* 1086)

A German aeroplane scout of the Albatros type, which was forced to land by a pilot in the British Royal Air Force. The Canadian soldiers were able to overpower the German pilot before he was able to set fire to his machine

Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

The most practical of men is the fighting man

When it comes to razors, the fighting man wants his Gillette.

It saves him space. It saves him weight. It makes his shaving clean, quick, safe. It is the razor used by his bunky and his messmates — by his comrades under all the flags of the Allied Nations.

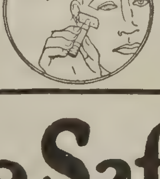
The Gillette is the *Service Razor* the world over.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Here's the Way to Get 100% Efficiency Out of Your Gillette

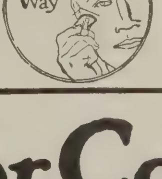


Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down *tight.* If you want a specially close shave, *unscrew* the handle a *part turn.*

Hold the razor *naturally* and *easily,* and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.



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Montreal, P. Q., Canada

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London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

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Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Post Impressions by a Young Bride, or the Twelve Pound Commissary Ham

In Vers Libre (Tres libre)

I.

A tiny bungalow screened safely in
Under wide protecting eaves.
Dawn breaking shrilly
In the middle of the night
To the raucous notes
Of a bugle.
Sleep filled eyes
And a balky range
And soot on one's fingers,
But ultimately breakfast!
And ham
With burned brown edges
—And eggs * * *

II

Motors throbbing.
Cadets,
And lines of khaki and blue
Watchful waiting for Ida or Mary,
Or anyone of those elusive southern girls
Who come to wash and sew on.
Only they don't—
And ham for luncheon,
Plain boiled ham
With potatoes * * *

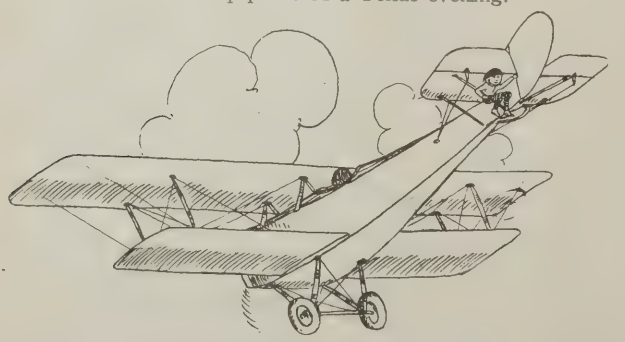
III

Flowers in the fields,
Red and blue and pink and yellow,
And dewberries.
The Red Cross meeting
And piles and miles of snowy gauze
And interesting bits
And ravellings of Post-news.
And the long white shell road home,
Hurried preparations for dinner,
And ham
Cunningly camouflaged * * *

IV.

Conversation concerning fuselages
And Hispano-Suizas
And the French Ace
And the bird that pulled an Immelman
At three hundred feet
And was confined to the post.
A stroll through the dark,
And the deep peace of a Texas evening.
Comforting sounds
The frogs chorusing
At the edge of the field.
The creak of the new boots,
And the soft glow of the little bars
On his shoulders.
The night ships, and the stars—
And romance * * *
Taps!
And a sociable bite before turning in.
Ginger ale
And ham—
Ham sandwiches!

—*Courtesy Ellington Field Tale Spins.*



The 20th Century "NIP BEHIND" or a Tail-Spin De Luxe.
—Courtesy Marvin Russell, Pacific Aero Club.

The Village Blacksmith

(*Revised R.F.C. Version.*)

Under the spreading hangar roof
The sergeant-major stands;
A fierce, imposing monster he;
All quake at his commands.
And the thunder of his booming voice
Is worse than German bands!

His hair is cropped beyond recall,
His face is like a boot;
His brow is wet with thoughts of debt
Incurred when a recruit.
He looks nobody in the face
(If so, they'd have to scoot!)

He goes at midday to the mess
And sits among the swells;
Then drags defaulters by the neck
And dumps them in the cells.
While his massive fists are tightly clenched
Like those of Billy Wells!

Week in, week out, from morn till night.
You can hear him curse the day
When he started on his maiden flight
And a beastly strut gave way,
When (according to his own account)
He was foremost in the fray!

Strafing, abusing, bellowing,
Onward through life he goes,
Each morning he contrives to add
To many an A/M's woes.
Something attempted, someone "run,"
Will earn him a damaged nose!

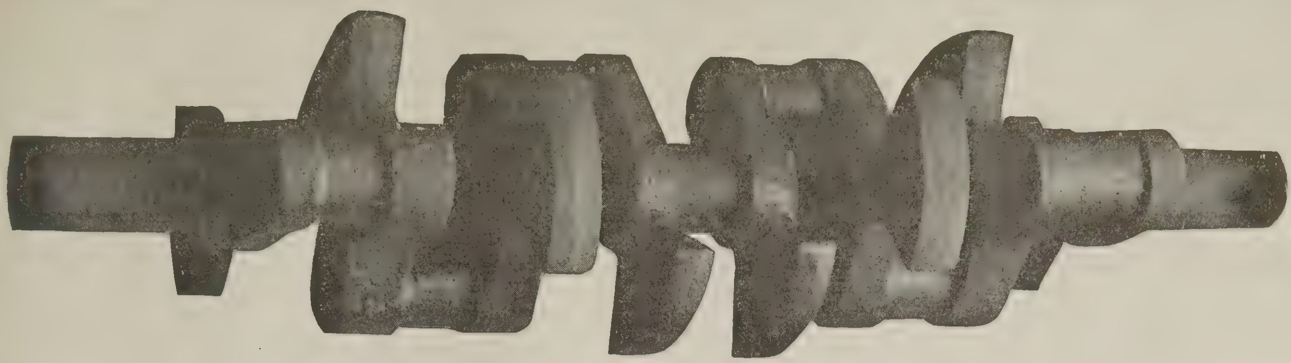
G. R. S.

Children of the Air

At play among the purple weeds,
Humming, in darts and flashes,
A dragon-fly on nectar feeds,
Then off he swiftly dashes.

Among the purple sunset mists,
Drumming, in sweeps and dashes,
A birdman wings where fancy lists,
And then away he flashes.

Margaret L. Seaman.



a counterbalanced aviation crankshaft . . . .

Patented July 10th, 1917

one of the 18 different
models we are now making
for 14 aviation motor companies . . .
reduces vibration and eliminates bearing pressure

We have shipped 63,771 Counterbalanced Crankshafts to July 24, 1918

THE PARK DROP FORGE CO. CLEVELAND, OHIO

(*Continued from page* 1059)

quantities. I have seen them work and they are satisfactory for bombing machines. Finer engines, made with much intricate and specialized parts, like a watch, cannot be made in quantities, but the Liberty motor can, which is a big advantage.

"War of the future lies in the air, for when the big commercial planes are developed they can easily be turned into fighting machines, with powerful offensive propensities. England was able to defend herself with a large navy, but it will be necessary in the future for nations to have large aerial forces.

"Battleships will be no match for the new aerial machines, which will revolutionize warfare both on land and sea. The activities of the fighting forces will be transferred to the air. Armies and navies will be unable to battle with the immense bombing machines of the future.

"The world will look to America for great developments in aviation because she has unlimited resources, while European countries are impoverished by long years of spoliation and destruction. America will manufacture large commercial machines. They will be speedy and able to carry a hundred tons instead of a thousand pounds as now."

Signor Caproni is in Paris on Government business. He expects to visit America, probably after war. His whole time is now devoted to war purposes. He is not developing commercial machines.

"Nobody is safe in being incredulous about the possibilities for development in heavier-than-air-machines," said Secretary Baker, commenting on Mr. Caproni's statement.

Navy's First Year in Planes Praised

One year ago the construction of the present naval aircraft factory in Philadelphia was authorized. Secretary Daniels has recently congratulated Naval Constructor E. G. Cosburn, U.S.N., for the year's work in these words:

"The Department desires to express its appreciation of your ability shown in organizing the naval aircraft factory to its present state of efficiency. One year ago the construction of the naval aircraft factory was authorized by the Department and you were detailed as its manager. This factory has been built in accordance with plans prepared by you, and the records shows that forms for the first flying boats were laid October 12, while the building was not completed until November 28. The first flying boat was given its successful trial flight on March 27, 1918, and since that date a steadily increasing rate of production has been observed. It is noted that the first order for fifty large flying boats has been completed and the greater part are now flying over British waters.

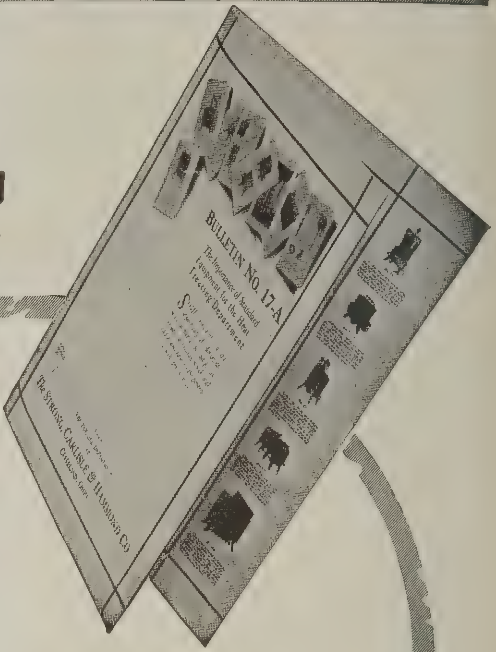
"It is believed that the creation in the space of one year of one of the largest aircraft factories in the country stands as a conspicuously successful example o the navy's preparation for war.

"The original factory had a floor space of 160,000 square feet, but an extension, which will add 55,400 square feet, is now practically completed."

How Airmen Hampered the German Drive

German prisoners are again complaining bitterly, according to the *Morning Post,* that since the present offensive began, their own airmen have given them insufficient protection from the bombing activities of the British flying officers. One referred especially to the British bombing of German troops and billets in the Bapaume area, where apparently great execution was done. This prisoner assumed—not unnaturally perhaps—that the British work in the other areas outside his personal experience had been equally deadly for his compatriots. A German officer prisoner belonging to a famous regiment stated that a few days before he was taken, a British airman dropped a bomb on an ammunition train in Weincourt station, and that the whole train exploded. It had been carrying a large number of shells for the 36-cm. Austrian guns. As a result the guns in question were able to play but a small part in the bombardment leading up to the German attack of April 24th, for lack of ammunition. Another prisoner enlarged at length upon the remarkable number of casualties caused by British bombing airmen in the Bapaume area at the end of March and during the first half of April. This prisoner said he had seen great masses of wrecked German transport and very many dead horses killed by the British bombs. The number of killed and wounded among the troops was also very large indeed. One German aerodrome, which he named, had to be moved back seventeen miles in order to protect it from the British bombs. This was not regarded as very helpful to the German infantry.

Send for Bulletin 17C



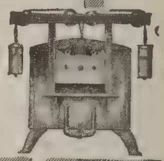
BULLETIN NO. 17-A
The Importance of Standard Equipment for the Heat Treating Department
The Strong, Carlisle & Hammond Co.

A letter, post-card or the coupon below will bring you your copy free

IN a period such as this, when the whole nation is confronted by serious problems, no individual effort is too small which can serve the nation's interest.

Industrial problems are particularly complex. The demand for production on an unprecedented scale is hampered by a dozen opposing factors.

The Bulletin pictured here is printed in the effort to show each factory manager how an expensive practice has arisen in heat-treating departments which can now be corrected. To remedy the practice will result in decreasing the expenses of the individual concern, while at the same time increasing the nation's output. In other words, it is equally important from the motives of profit or patriotism.



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THOMAS-MORSE AIRCRAFT CORPORATION

ITHACA, N.Y. U.S.A.

Contractors to U.S. Government

(*Continued from page* 1075)

"Joy" Flying Forbidden

London.—The numerous collisions in the air, resulting in fatalities has caused an order forbidding any officer to fly except on duty and after production of a certificate from the colonel. This will put an end to the great number of joy flights which infantry subalterns enjoyed at the hangars of their flying friends, often resulting in accidents.

Same Here

Lieut. Commander T. H. Newberry, aide to Rear Admiral Usher, commandant of the Third Naval District, has intimated that prompt action would be taken to stop the reckless flying of student naval aviators, which has caused widespread complaint among cottagers along Great South Bay.

Build 15-Ton Planes Here

Portland, Ore.—Outlining the nation's aircraft program after an inspection tour, which took him through the spruce districts of the Northwest, John D. Ryan, Federal Director of Aircraft Production, announced that the United States now was producing aeroplanes weighing fifteen tons and equipped with four motors of the Liberty type.

Mr. Ryan said the larger types of bombing planes would be manufactured in the United States, but that the smaller scouting and battle planes would continue to be manufactured overseas.

Production of the Liberty motor is increasng every month, Mr. Ryan said. Four hundred were turned out in July and the estimates place the August production at five hundred machines. He said the "peak of production" probably would be reached in November or December. Orders have been placed for fifty thousand motors, he said, 27,500 of which are to be turned over to other governments.

When Insects Take to Aviation

According to Lieutenant Depret-Bixio of the French Army, who is a naturalist as well as a flying man, many insects follow captive balloons in their ascent. He has seen flies go as high as 2,970 feet, after which they die. Grasshoppers cling to the basket of the balloon until the air becomes too rarified for them, when they let go and fall. He says the swallows have a glorious time catching these insects.

Brilliant Aeroplane Flare is Perfected to Aid U. S. Flyers in Night Bombing Operations

Maj. Gen. C. C. Williams, Chief of Ordnance, authorizes the following:

An aeroplane flare with a brilliancy equalling that of 400,000 candles has been perfected. When hanging from its parachute over a German munition plant it lights up an area so brightly than an airman, thousands of feet in the air, can select any building he is directed to make a target for his aerial bomb, and, it may be added, American aviators are becoming so expert in bombing that they can usually hit the target at which they shoot.

In every European city within the zone of aerial raiding operations, the rule is rigidly enforced against the burning of lights in any building that might possibly be used as a target. Therefore, the airman must be able to supply his own means of locating the object of his attack.

When orders are received to bomb, say a particular railroad center, the aviator proceeds very much in the same manner as does the captain of a vessel. The cities and their environs are charted and the night-flyer proceeds by compass, due allowance, of course, being made for atmospheric conditions. He is also frequently aided by prominent markings, such as the reflection of moonlight from a river.

Having reached the particular district sought, he must locate the particular object of his attack from his position, which may be 5,000 or 10,000 feet, or even higher, above the earth. Equipped with the aeroplane flare, the aviator pulls a lever and releases it. As it drops, the resistance offered by the air sets the fuse mechanism in operation. The result is the emission of a powerful light of from 300,000 to 400,000 candlepower, which completely illuminates the terrain below. The amount of light given is equal to that of a battery of from 150 to 175 street arc lamps, or of from 15,000 to 17,500 ordinary incandescent lamp bulbs such as are used in the home.

As soon as the flare gets into operation, a huge parachute made of the best quality of silk opens and holds the brilliant light in suspension in the air for a sufficient time to allow the aviator to select his objective or target. Having located the factory, railroad depot, ammunition dump, hangars, munition plant, or whatever the target may be, the aviator drops the bomb and proceeds on his way.

The height at which an aviator flies when attacking depends, of course, on surrounding conditions. If the enemy is aware of his presence and is preparing for attack, he must keep up and out of range of antiaircraft guns. An idea of the effective light thrown on the ground by this flare may be gained from the fact that, when suspended at a height of from 1,500 to 2,000 feet it will clearly light a circular area one and a half miles in diameter. When on a bombing raid, an aviator seldom flies at such a low height, more generally keeping 5,000 feet or more above ground, in which case the effectively lighted area is, of course, diminished.

Planes Hover Continually Over the American Capital

Washington.—Flying has become a daily event here with the construction of a large hangar at Potomac Park housing several Curtiss J-N 4 aeroplanes. A DeHaviland aeroplane equipped with two Liberty engines has just been added, and two Spads are expected shortly. In addition there is an Avro aeroplane here, shipped from England, built by A. V. Roe & Co. and equipped with a 100-h.p. Gnome engine. The Avro plane is the property of the British Mission and is used exclusively by General C. F. Lee, who heads the British Aeronautical Mission in this country. General Lee was practically the first flier to exhibit the maple leaf drop, the "Immelman" turn, the spiral fall and the other "stunts" used at the front, in Washington. His exhibits have been watched with great interest by President Wilson and the various War Department officials.

Many fliers are stationed in the aviation section in Washington at desk work. In order to maintain their records and to secure the 25 per cent extra monthly pay allotment awarded to fliers provided they are in the air a certain number of hours each month, these men make frequent use of the Curtiss J-N 4 planes. Several may be seen flying each day at all hours, over the State, War and Navy buildings, the White House and the city proper.

Aviation Expert in Washington

Washington. — Lieutenant-Colonel Sir Henry Fowler, in charge of the Sectional Components of Aircraft, and Assistant Director General of Aircraft Production of the British Ministry of Munitions, has arrived in this country on a special mission concerning aeroplanes.

Personal Paragraph

Julian S. Friede will leave shortly for Toronto to become a cadet in the Canadian Royal Air Force. For two years Mr. Friede has been an important factor in the engineering department of the Paige-Detroit Motor Car Co., where his chief work has been body designing. In his new military efforts he will specialize on radio work and flying.

THIS AEROPLANE STRUTT

Was made on a

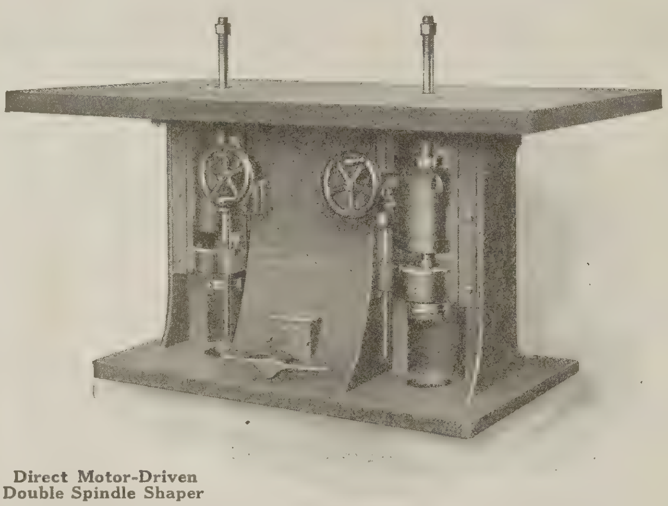
WHITNEY SHAPER

No trick to do it

Do you want to know how?

Write

Baxter D. Whitney & Son
Winchendon - - Mass.



Direct Motor-Driven
Double Spindle Shaper

(*Continued from page* 1080)

Schleifer, Elmer Otto	SLA; SMM
Sherrick, Leon Danfreth	SLA; KST
Spencer, George S.	DAP
Slocum, Winfield S., Jr.	CJS
Schank, Harry Edward	SLA; KST
Smith, Wayne G.	DMA; PFO; Note 1
Smith, James Roy	SLA; PFO
Seaton, John W.	SMM
Shepard, Frederick B.	SMM
Squires, Paul R.	SMM
Smith, Hart G.	SLA; LDT
Spofford, Benjamin Dwight	SLA; KST
Sherry, Bertram J.	FLR

T

Thompson, Adam Gentles	SLA; DAP
Thomson, William White	SLA; CFT
Taylor, Richard F.	DIK
Taylor, Arthur W.	EOT
Tanner, Olav J.	DIK
Thrig, Howard K.	DIK
Tinsley, George C.	SMM
Treat, Verne E.	TFT
Tolles, Raymond P.	TFT
Tuska, Clarence D.	LDT
Taylor, Russell Louis	SLA; TFT
Tufts, Russell Daniel	SLA; KST
Treleaven, Peter W.	KST
Trabold, Arthur R.	DMA
Thomas, Ernest William	SLA; CGC
Thompson, Neal	DMA
Tanner, Olav J.	CFT
Thompson, John F.	LHV
Taylor, John A.	LHV

U

Utley, Charles B.	TFT

V

Vaile, Rawson	FLA; DAP
Van Arsdale, Maurice William	SLA; CFT
Vincent, John H.	EOT
Vickery, James C.	SMM
Von Allmen, Paul J.	TFT
Verheyden, Edward J.	FRF
Vaughn, Guy Otis	SLA; CFT
Vickers, Albert Henry	SLA; CGC
Van Veghten, Theodore S.	FRF

W

Whitaker, Joseph H.	FRF
White, Willie C.	FRF
Wilbourn, Arthur E.	WDM
Wilkes, William Douglas	SLA; DAP
Wood, Ivan D.	GLC
Winants, Garrett E.	EOT
Wellford, Armistead L.	SMM
Walker, Stephen P.	TFT
Wiegmann, John P.	TFT
Williams, Roger Q.	SLA; TFT
Wolfe, Kenneth B.	FRF
Warren, Edward W.	Note 3
Wade, Don D.	DIK
Wooten, Ralph H.	DIK
Wright, Harry Johnson	SLA; CFT
Wagoner, George A.	DIK
Wood, Raymond	SLA; PFO
Whitehead, Cecil F.	DMA
Wrigley, Paul Pickering	SLA; GLC
Wright, John Brandon	SLA; KST
Walton, Richard S.	FRF
Williams, Errett	DIK
Woolsey, Clinton F.	DIK
Wall, John E.	FRF
Wallis, Edmund C.	LHV
Wren, Samuel M.	LHV
Williams, Raymond B.	EOT
Wirgman, Stewart L.	DIK
Washburn, William C.	CGC
Wagner, Ralph	SMM
Welsh, Floyd E.	Note 9
Wacaser, Frank E.	TFT

Y

Young, Bentley	EOT
Young, Crawford	DIK
Yeomans, William Edward	EOT
Yerkes, Lawrence A.	DIK

Z

Zalibra, George Charles	SLR; DMA
Zimmer, Harry M.	DIK

In Air More Than Thirty Hours

The Navy Department has received a dispatch stating that Ensign P. J. Barnes, United States Naval Reserve Flying Corps operating in European waters, has established a new endurance record for the "Blimp" type of airship by remaining in the air thirty hours and thirty minutes.

Learn Night Flying

Ellington Field, Tex.—A new course in advanced night flying has been inaugurated to simulate conditions that the pilot will encounter when he crosses the lines after dark. A powerful searchlight has been installed.

Air Advantage Will Blind Hun Says Masefield

"Our success in the war depends upon an overwhelming superiority in aeroplanes," said John Masefield, famous English poet who visited Kelly Field recently. "This will blind the Germans and prevent their obtaining knowledge of the movement of our troops and material."

The poet delivered three addresses to the men of Kelly Field, speaking at Y. M. C. A. 160, and at the Aviation Clubs in the First Training Brigade and Flying Department.

'Plane Mishaps Fault of Fliers, Says Kenly

Washington.—General W. L. Kenly, chief of the Department of Military Aeronautics, informed Representative Olney, of Massachusetts, on July 15th that accidents at the several flying fields where cadets are in training were in the main caused by carelessness and disobedience of orders. General Kenly stated in a written communication that everything possible was being done by the army authorities to minimize the dangers to cadets and to reduce the number of accidents.

Skilled Mechanics May Be Inducted for Brooks Field

A number of skilled mechanics are needed at Brook's Field, San Antonio, Tex. Men in the draft age who desire to enlist in the Air Service may do so by interviewing the commanding officer in Brooks Field and then arranging with their local draft boards to be inducted into the service. Men, not of the draft age, may also enlist at Brooks Field which has special permission from the War Department to accept the first properly qualified men who apply.

The vacancies have been created by the recent transfer of a number of men not sufficiently qualified as mechanics. Engine repair men, magneto experts, machinists, sailmakers and blacksmiths are especially needed, as well as men skilled in driving and repairing automobiles. A number of stenographers are also needed for work in the clerical force. Skilled men may obtain the rank of Master Signal Electrician at $81 per month, while the best men may qualify for commissions as reserve military aviators.—Kelly Field *Eagle*.

Name New Aviation Field

The landing field two miles south of Austin, Tex., has been named Penn Landing Field in honor of Cadet Eugene D. Penn who was killed while flying in Italy on May 21 last.

Change Work Hours of Flying Department

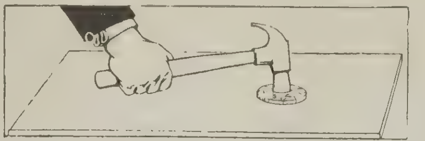
The work hours of the men in the shops of the Kelly Field Flying Department have again been changed, at the request of the men themselves, following the report of the weather bureau that the hottest hours of the day are from 3 until 5 o'clock in the afternoon.

The hours are now from 6 a. m. until 4 p. m. Originally, they were worked from 7 .a. m. until 5 p. m. Under the schedule which existed before the present hours became effective, they worked even later, but with a longer rest at noon.

RESISTAL

Is the Only Guaranteed Non-shatterable Safety Glass in Aviators' Goggles

Many other goggles claim to have lenses of Safety Glass, but before trusting your life to the airplane, just put them to the hammer test.



TEST NO. 1—Break any piece of any other kind of glass with a single hammer-blow. Note result. Some of the glass particles may remain in the rim but what happens to your eyes from the particles that fly?

TEST NO. 2—Hit a RESISTAL lens a single blow in the same manner with same hammer but be sure you hit a harder blow this time. Note result. The glass will crack but not a single dust particle, much less a sliver, will fly. Your eyes are safe behind RESISTAL.

We will send you free unmounted pieces of RESISTAL lenses to hammer and crack at your pleasure. The U. S. Bureau of Standards has conducted two exhaustive tests of non-shatterable glass. As a result, the U. S. Army and U. S. Navy use aviator goggles with RESISTAL lenses. Write for these reports.

EYETECTS are the only goggles with lenses of RESISTAL

They have already proven, in hundreds of cases, their life-saving value and there being no substitute, your eyes are safe only when your goggles are RESISTAL EYETECTS; any other kind are dangerous.

RESISTAL S.&B.N.Y.

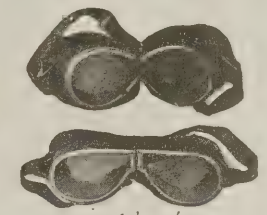
Look for this trade mark on your goggle lenses

STRAUSS & BUEGELEISEN

Sole Manufacturers

438 Broadway, New York City

Send for Booklet on RESISTAL EYETECTS telling of many aviators' experiences



2 styles of RESISTAL EYETECTS for aviators

Week End Flights Made By Officers

Eight aviators carrying passengers made week-end trips from Kelly Field. Three visited Corpus Christi, leaving Friday morning and returning late Saturday night. Lieuts. W. C. Dorset, F. F. Watson, and J. L. Whitney were the men who made the trip to the sea coast.

Lieuts. George A. Cary and N. F. Goodyear visited Victoria, and Lieut. H. T. Highley flew to Cuero. Lieut. H. C. Roberts journeyed to Madisonville, and Lieut. E. J. McCarthy made a flight to Camp Stanley.

Revolutionists in German Army Destroy Aerodrome

London.—The destruction by fire of a new German aerodrome, with twenty-two aeroplanes, near Nivelles, is attributed to the work of German revolutionists in the army, says an Exchange Telegraph despatch from Amsterdam on July 17th. Nivelles is seventeen miles south of Brussels.

Ten Belgians and two German non-commissioned officers have been arrested.

The day before the fire, adds the despatch, a secret meeting occurred in a canteen at Nivelles, where the scheme for the destruction of the aerodrome was discussed.

Italian Aeronautic Mission Opened

On July 1, 1918, an Italian Military Mission for Aeronautics in the United States was established under the leadership of Capt. Giuseppe Bevione, member of the Chamber of Deputies, with offices at 1829 I Street, N. W., Washington, D. C.

All matters pertaining to Italian Military Aviation in this country will be referred to this mission.

First 'Plane Business Established in Brazil

Washington.—The first aeroplane factory in South America designed to build airships commercially has been established at Sao Paulo, Brazil. The first aircraft was built by Sebastian Carani, and is reported a success.

Aeroplane and Balloon for the Panama Canal

In order to guard the Panama Canal from attack from the air as well as from the land and the sea, it has been decided to place an aero coast defense squadron and a balloon coast defense company in that military department near the Atlantic and Pacific coasts.

A board of officers, consisting of Maj. Walter W. Wynne, N. A., and First Lieuts. Ernest R. Burnlight and Thomas R. Evans, S. R. C., has been appointed to select the most advantageous site for the location of those units.

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

By sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aeropost service east, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M.		A. M.		A. M.		A. M.
G. P. O..	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq. ..	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times ...	10.40
D	10.20	O	10.35	Y	10.30	Tomp ...	9.40
F	10.30	P	10.20	College ..	10.05	Tremont .	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent..	10.55	Wash. ...	9.46
I	10.20	T	8.35	H. G. ...	10.00	W. F. ...	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

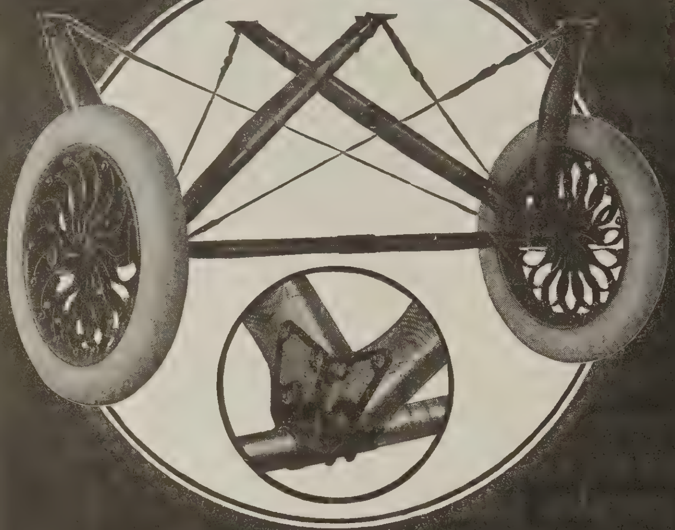
The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only three cents (3c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making sixteen cents (16c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.



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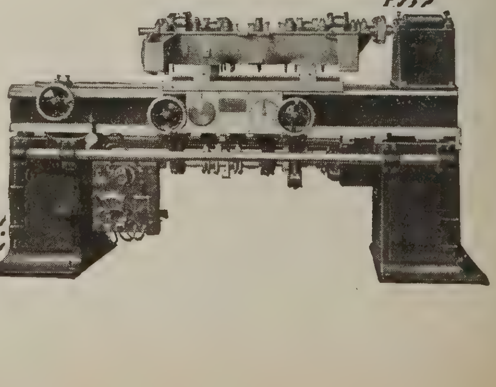

AERIAL AGE WEEKLY

Vol. 7, No. 23 AUGUST 19, 1918 10 CENTS A COPY

A Squadron of American Aviators Practicing Formation Flying

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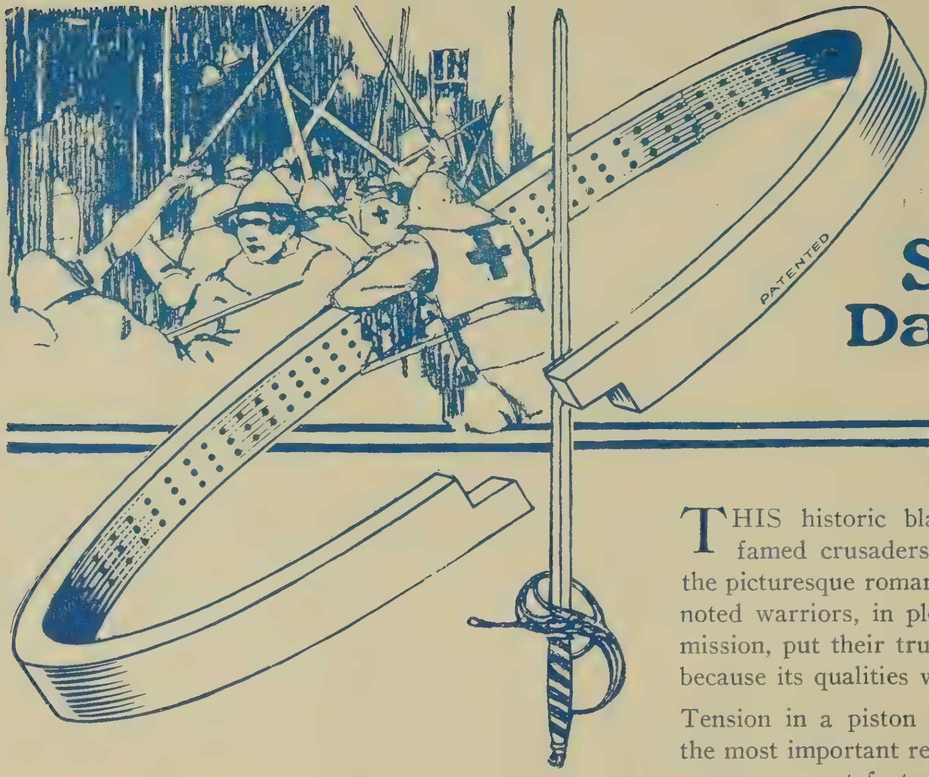
When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
NO WRAPPING — NO ADDRESS
A. S. Burleson, Postmaster-General

What Can the Aeronautic Industry Look Forward To?



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THIS historic blade was the weapon of the famed crusaders whose names conjure up all the picturesque romance of the middle ages. Those noted warriors, in pledging their lives to a sacred mission, put their trust in the Sword of Damascus because its qualities were *hammered in.*

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VOL. VII NEW YORK, AUGUST 19, 1918 NO. 23

WHAT CAN THE AERONAUTIC INDUSTRY LOOK FORWARD TO?

By HENRY WOODHOUSE

WHAT is the future of aeronautics—what can the aeronautic industry look forward to?

This is a question that comes to us often these days. Scores of firms have taken up aeronautic work and most of them have either lost or given up all other business. Therefore they inquire regarding the future of aeronautics.

The day of the inauguration of the first permanent aerial mail line, with aeroplanes owned and operated by the Post Office, is an appropriate time to answer this query. This event marks the advent of the aerial age, an age which may be even greater than the steamship age and the railroad age.

We have answered this query a great many times each year since 1910, and, somehow, our answers have always been correct, although they appeared extremely enthusiastic at the time they were made. A great many millions were invested on forecasts which we made, and nobody has lost in following our estimates.

Forecasting the Future

(1) The aeronautic situation today is exactly as it was two years ago, but the proportions are very much greater. Two years ago at this time there were not as many aeroplanes in the army and in construction as there are today in the Aerial Mail Service.

(2) Two years ago at this time General Pershing was waiting impatiently for half a dozen aeroplanes for the Mexican campaign, and the Army did not have as many as 17 aeroplanes, which is the number of machines being operated by the Post Office for carrying mail today.

(3) Those of us who went before Congress and told Congress that the United States should have 5,000 aeroplanes were considered extremists. Nevertheless eighteen months later the American public grew impatient and indignant because only about 10,000 aeroplanes and motors have been produced in the past fourteen months. The increase in number of aircraft employed in the war will be so great by next year that the production of 100,000 aeroplanes a year will be considered modest.

To answer the query regarding the future of the aeronautic industry we must look into the future just as we looked into the future two years ago, or six and eight years ago, and try to estimate the changes which may be expected in the world's affairs from the present extraordinary situation and the possible development in size and employment of aeroplanes.

(4) The duration of the war is the first thing to be considered. A war of such magnitude as the present war cannot end like a summer shower. It is more likely to smoulder on for years like a forest fire, because even if Germany should propose peace under conditions entirely favorable to the Allies, it would not be wise to discontinue the work of preparedness or to stop the manufacturing of war materials, because our enemy is a treacherous enemy and cannot be trusted. Therefore the manufacturing of war materials may be expected to continue for probably a year after the negotiations for peace begin.

Army Aeros for Civil Uses

Supposing the war lasts another two years—and that seems to be the absolute minimum. Considered from the standpoint of two years hence, and with two years in which to develop commercial aeronautics and establish aerial mail lines across the continent, across the Atlantic, in South and Central America, Canada, Australia and other countries where aerial transportation will solve some of the great difficult problems of transportation, we can expect to be able to use 50 per cent of the entire output of aircraft for commercial purposes. This may be true if every effort is made in the meantime, beginning right away, to develop the aerial mail service.

If the war lasts three years longer, and every effort is made in developing the aerial mail service, when the war comes to an end not less than 70 per cent of the aeroplanes being built today can be used for the maintenance of our national defences and the aerial mail and express service.

If the war lasts four years and every effort is made, the entire output of our factories can be utilized entirely for transportation and maintenance of our national defences.

(5) Just as those of us who worked for the building of our air forces pointed out in 1914, 1915, 1916 and 1917, that a substantial aerial mail service would build up a powerful reserve of trained aviators and develop valuable aircraft manufacturing facilities which would be available for national defence in case of need, we must today recommond this same measure to protect the welfare of this country and safeguard civilization.

(6) It is hardly necessary for me to point out that now that we have aeroplanes capable of lifting fifteen tons and going at a speed of about 100 miles per hour, and the Air Service comprises over 10,000 aviators, and the non-flying personnel numbers over 100,000 men, the general application of aircraft for transportation is to come fast.

(7) Only a few days ago a despatch quoted Mr. John D. Ryan, the energetic Director of Aircraft Production, as saying that there is a type of aeroplane under construction which is to be equipped with four Liberty motors, or 1750 horsepower. This air cruiser will probably be capable of lifting close to 40,000 pounds, and the limit in size has by no means been reached. A 5,000 horse-power aeroplane may cleave the air before we are a year older.

To Cross the Atlantic

Likewise delivery of mail across the Atlantic and across the continent may be as common next year at this time as the delivery of mail by aeroplane on the New York-Philadelphia-Washington route is today. The mail will be much heavier over long distances, because then the aeroplane will make it possible to make deliveries a number of days sooner.

(8) The fact that the radius of flights of aeroplanes is extending to 2,000 miles, and may extend to 4,000 miles within two years, brings hope for closer understanding between nations after the war, due to faster transportation and intercommunication, but also brings the menace of disaster which may befall to our generation if the control of the air should be gained by a troublesome country like Germany.

As a matter of fact, it is known that Germany is planning extensive aerial mail, express and passenger transportation.

(9) Large aeroplanes capable of flying across the Atlantic will revolutionize the world economically and sociologically by bringing nations into closer relationships and eliminating frontiers; but they will also make it possible for a troublesome country like Germany to build an enormous reserve of aircraft, obviously entirely for aerial transportation, but which

may be turned into terrible weapons by simply replacing the cargo of mail with loads of explosives to drop without warning on some unsuspecting country.

(10) As a matter of fact, it is known that Germany is planning extensive aerial mail, express and passenger transportation lines, to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of large aircraft. This would give her a reserve fleet large enough to blow England, France or Italy and cities on the American continent off the map overnight. As was brought out in the House of Commons by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. A nation that overlooks this fact may pay dearly for its oversight.

(11) We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids on Belgium, France and Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, the Allies must be ready to protect the rights of Humanity and the Cause of Civilization.

(12) Anything that is done to bring into use thousands of aircraft for civic purposes is a contribution towards placing the United States and the Allies in the position of the porcupine, which goes about its peaceful pursuits, harms no one, but is ever ready to defend itself. The Post Office can use thousands of aeroplanes for the Aerial Mail Service—which will form a valuable reserve for national defense. In assisting the development of the Aerial Mail Service we are assisting the development of future aerial reserves as well.

(13) Few people realize that aerial mail and express service actually means economy in dollars and cents. The same people who today spend from fifty cents to three dollars for telegrams and more than that for cables will soon be using the Aerial Mail Service extensively because it makes it possible for them to send a written message just as fast by aeroplane, but at only a fraction of the cost of telegrams and cables. Those of us who have been using the Aerial Mail Service between New York and Washington find that it is quicker and much more efficient than the telegraph, principally because it does not take longer, and it carries a much longer message written in our office as a letter, and can carry at the same time other papers, which, of course, could not be sent by telegraph or cable.

(14) The fact that the aerial mail is just as quick as the telegraph and cable, but is more economical and efficient, insures its future. The fact that it will develop extensive reserves and manufacturing facilities makes it a valuable asset to the cause of the Allies and civilization.

The Post Office has plans for hundreds of aerial mail lines, each of which may in future have aeroplanes running day and night, and starting every half hour. As soon as the transatlantic aeroplanes come into being there will be transatlantic mail lines to carry mail in every direction of the globe, and for each line there will probably be two or more huge aeroplanes starting every half hour, making a minimum total of forty-eight large air liners required for each air line. We know that a hundred of these large air liners will be the equivalent of a thousand of the present size aeroplanes; therefore the amount of aeronautic business will be enormous.

One hundred thousand large aeroplanes will not appear a large number when they are employed for aerial transportation, nor will ten thousand pleasure aircraft, but they will give the aeronautic industry ten times the work it has to do today.

THE WAR MEDAL AND DIPLOMA OF THE AERO CLUB OF AMERICA

THE Aero Club of America has had a special war medal struck in Paris, designed by the famous medalist and sculptor, Pierre Roche, recently chosen by the French Government one of the four artists to compete for the design of the medal to be established by the Government symbolizing the entrance to the United States into this war.

The medal itself is very beautiful and expressive, having on one side of it an allegorical figure representing the tenth muse—The Muse of the Air—with an inscription in Latin, "Coeli Colis Stellarum Corona", which translated means, "To the Heroes of the Skies, a Crown of Stars". There are forty-eight stars representing the States; thirteen stars representing the original colonies, form the Crown.

The other side of the medal contains the seal of the Aero Club of America, with entwined laurel and the inscription "Honor and Merit", which explains the purpose for which it is awarded. The name of the recipient will be stamped on a gold ribbon indicated on the medal, and underneath is the date 1917, the year of the entry of the United States into this war.

Accompanying the medal is a handsome diploma executed by Pierre Fritel, showing the spirit of aviation, protected by the shield of Medusa, coming to the rescue of outraged Justice, and attacking, with a flaming sword, three snakes about to strike an innocent mother and her children, which a noble figure of Justice is endeavoring to shield.

This medal and diploma have been awarded by the Aero Club of America, acting through their Foreign Service Committee, of which Ambassador Sharp is the Honorary Chairman, to the following aviators representing the United States, France, Great Britain, Italy and Belgium.

United States

Major Raoul Lufbery, Corporal L. Norman Barclay, Corporal Julian C. Biddle, Corporal Andrew Courtney Campbell, Corporal Oliver M. Chadwick, Lieutenant Victor E. Chapman, Sergeant Edmund G. Genet, Sergeant Ronald Hoskier, Sergeant James R. McConnell, Sergeant Douglas McMonagle, Lieutenant Norman Prince, Sub-Lieutenant Kiffen Yates Rockwell, Corporal Stuart Walcott, Major William Thaw, Sergeant Frank L. Baylies, First Lieutenant David E. Putnam.

France

Captain Georges Guynemer, Sub-Lieutenant René Dorme, Adjutant Maxime Lenoir, Lieutenant Jean Chaput, Lieutenant Charles Nungesser, Lieutenant Roland G. Garros, Lieutenant René Fonck, Captain Alfred Herteaux, Lieutenant Georges Madon, Captain Albert Leon Daullin, Captain Armand Pinsard, Sub-Lieutenant Guerin, Sub-Lieutenant Maurice Boyau, Sub-Lieuteant Omer Demeuldre.

Great Britain

Captain Albert Ball, Captain Philip Fletcher Fullard, Major William Avery Bishop, Major Edward Mannock, Major James B. McCudden, Captain Roderic S. Dallas, Captain Collett.

Italy

Major Francesco Barracca, Lieutenant Olivari, Colonel Piccio, Lieutenant Giulio Barachini, Captain Prince Ruffo di Calabria of Naples.

Belgium

Lieutenant Thieffry, Lieutenant Willy Coppens.

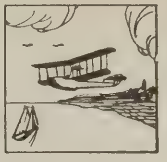
Aero Club Receives Medal

The Aero Club of America has received a copy of the Gold Medal awarded by the Aero Club of France to aviators who have distinguished themselves in military service. This medal is a very beautiful work of art, which shows the successful achievement of flight represented by a beautiful figure seated among experimental parts and finally seeing the Beacon Light of Inspiration while the figure of a dirigible balloon is floating over the horizon.

On the reverse of the medal is a winged figure awarding a palm which signifies honor and glory to the name of the one to whom the medal is awarded.

Accompanying the medal is a plaquette in silver, given to men who excel in the operation of machine guns, and bomb dropping and in evolutions at the schools, preparatory for actual military service. Upon one side is a beautiful executed battleplane diving upon an enemy machine and in the sky is the inscription "Pro Patria". Upon the reverse is shown a bombardment machine passing over a village where fires and smoke can be seen, started by the bombs which have evidently just been released.

THE NEWS OF THE WEEK



General Term "Air Service" to Designate Two Bureaus

The War Department authorizes the following:

In a communication received at the offices of Maj. Gen. W. L. Kenley and Mr. John D. Ryan, from the Adjutant General's Office, it is stated that hereafter Air Service will be the general term, including the Division of Military Aeronautics and the Bureau of Aircraft Production.

The officers and enlisted men of the Division of Military Aeronautics and those serving in the Bureau of Aircraft Production shall be known as member of the Air Service, Military Aeronautics, and Aircraft Production, respectively.

The chief of the Bureau of Aircraft Production will hereafter be addressed as the Director of Aircraft Production, and the chief of the Division of Military Aeronautics, as the Director of Military Aeronautics.

Another Training School for U. S. Balloon Pilots

Secretary Daniels announced that the Navy contemplates establishing an additional training school for balloon pilots. This school will probably be located at some point east of the Mississippi and south of the Ohio River, and it is hoped that suitable quarters for the personnel can be secured at some school, university, or country club.

In addition to available buildings, a field will be necessary to carry on the outdoor work. It is also essential that there be good transportation facilities at the point selected.

New Air Service Field Opened at Jackson, S. C.

The War Department authorizes the following statement from the Division of Military Aeronautics:

Emerson Field, a new Air Service flying field at Jackson, S. C., was opened on August 1. It is named in memory of Lieut. William Emerson, Field Artillery, who was the first artillery officer killed while serving with an American aero squadron at the front.

The field, which was authorized on May 2, is to operate in conjunction with artillery, and for this purpose includes both aeroplanes and balloons.

At present there are about 450 officers, including pilots, and 350 men stationed at Emerson Field.

Naval Aviation Section Wants Carpenters' Mates

Experienced carpenters and cabinetmakers are desired by the navy as carpenters' mates, aviation service, it is announced by the officer in charge of local recruiting headquarters.

As fast as applicants are enrolled in this branch of the service they will be assigned to the receiving ship at Charleston, S. C. Desirable ratings may be obtained by those who have the necessary qualifications, officials stated.

Belgian Ace Gets 24 Foe Aircraft in Lone Battles

Dispatches received by the Belgian legation give the first official accounts of the recent daring exploits of the "ace of aces." Coppens has been awarded the Order of the Crown and the cross of the Knight of the Order of Leopold for bringing down twenty-one German war balloons in three months.

The last successful encounter was made with German balloons on July 22, when the lieutenant succeeded in destroying three enemy balloons in five minutes.

3,000-Mile Flight for 22 War Planes

What promises to be the greatest aeroplane cross-country flight ever made will begin in Cincinnati on Aug. 14, when a squadron of twenty-two American and British planes, in charge of Major C. K. Rhinehardt of the First Provisional Wing, U. S. A., and Brig. Gen. Lee of the British Royal Flying Corps, will fly 3,000 miles, stopping at fourteen cities. The trip has been arranged by the Division of Military Aeronautics, assisted by a sub-committee of the Committee on Public Information. The purpose of the flight is to give the people of the Central States a better idea of the progress of aviation than they have heretofore been able to get, and also to give a thorough training to the aviators who will probably be selected to make the proposed flight across the Atlantic.

Lieutenant Arthur J. Coyle, Flight Commander First Aero Squadron, U. S. A., to whom has just been awarded the French War Cross for having fought off three German Combat planes while his observer photographed enemy lines northwest of Toul

Britain's Air Force Shows Huge Growth

Figures showing the marvelous development of the British air force in four years of war have been supplied by the New York "Times" from a well informed source. Four years ago the British possessed considerably fewer than a hundred aeroplanes. Now the Royal Air Force alone destroys in an average week a considerably larger number of enemy aeroplanes than Britain possessed when the war began.

In June last the number of enemy aircraft brought down, which means destroyed, by the British alone, was 314, while the number driven down out of control was 168. As against that total of 482 enemy machines destroyed or driven down, 168 British machines were reported missing.

During one month British airmen fired at ground targets 915,308 rounds of machine-gun ammunition. During this same month they dropped 853 tons of bombs over different military objectives and made no fewer than seventy-four separate bombing raids over Germany itself, apart from their work over the battle area, and engaging nearly 2,000 enemy batteries.

These are figures of combat work only. In a single month the Royal Air Force has taken well over 40,000 photographs over enemy lines. There is also work carried out in co-operation with artillery by means of which the fire of the gunners is directed with precision upon enemy guns and gun emplacements, billets, transports, dumps, railways, and concentrations of troops.

During the year ended June 30 British airmen accounted for considerably over 4,000 enemy aircraft, while the number of British machines reported missing was just over 1,000. Apart from new production, which is, of course, enormous, the Royal Air Force now reconstructs many more machines in a month than Britain possessed altogether at one stage of the war. It is no uncommon thing for British airmen to bomb military objectives in Germany itself three times in one day.

Hydro-Aeroplane Base to Cost $2,000,000

Galveston.—It is authoritatively announced that the hydro-aeroplane training base which the Navy Department will construct here will cost approximately $2,000,000, and will be the largest in the United States. The proposed buildings, for which plans are now being drawn by L. B. Hyde, civil engineer in the Navy Department, will cover 60 acres.

Plans call for the erection of six hangars, built in two sections, and with accommodations for 24 hydro-aeroplanes. The hangars will be erected at the north-eastern part of the site fronting Galveston Bay. Each section will be 104 x 105 feet in area and completely equipped for the housing of flying machines. Each section of the hangars will be provided with a landing pier 200 feet in length. To the south of the hangars will be the machine-shops and repair shops.

A considerable portion of the site will be devoted to the ground school, where student aviators will receive preliminary training.

An observation tower, 120 feet in height, will be erected, from which the officers in charge of training may have a good view of the flyers in training and observe the character of their work.

There will also be an office building and an administration building, each two stories high.

The building to be used as quarters for the officers and student aviators also will be a two-story structure, somewhat in the shape of a letter H. The ground floor of one side of the building will be devoted to the recreation room, dining room, kitchen, store room, refrigerators, etc. The remainder of the building will be quarters, with each bedroom 10 feet 6 inches by 12 feet 6 inches.

Barracks for several hundred men, with mess hall and other necessary equipment, will be provided, as well as a dispensary.

Athletic Building Dedicated to Dead Flyer

Mount Clemens, Mich.—The new athletic building which has been completed at Selfridge Field was dedicated on Aug. 3 to the memory of Second Lieutenant John P. Boyle, an aviator and athlete, the first officer to meet death at the field. Local people assisted substantially in erecting the building, pledging more than $2,200.

American Fliers Win Over Boche at Front

American trained fliers of the 1st Pursuit Group at the front, according to the latest authentic records given by Captain Lyster, Adjutant, have downed the following planes: Lt. Campbell, 5; Lt. Rickenbacker, 4; Capt. Peterson, 3; Lt. Winslow, 2; Lt. Buford, 2; Lt. Mitchell, 2; Lt. Sewall, 1; Lt. Meissner, 1.

Working together the following men has downed one plane: Capt. Hall, Lt. Rickenbacker; Lt. Hambleton, Lt. Taylor; Lt. Hambleton, Lt. Buckley, Lt. Casgrain, Lt. McKeown and Lt. Mitchell; Lt. MacArthur, Lt. Patrol.

Cadets Get Privates' Pay for This Month

Because no appropriation has been made by Congress for the salaries of flying cadets they will receive the pay of enlisted men this month and until such time as the appropriation is made according to a telegram received from Washington.

It was reported that the pay of the cadets has been reduced to $30 a month, that of the private, but such is not the intention of the War Department, if the telegram received has been interpreted right. The cadet, whose pay is $75 a month, the increase being due to the danger of his work, will in all probability collect the difference between $75 and $30 after the appropriation has been made by Congress.

New Flying Field at Austin

Austin, Texas.—Penn landing field near Austin soon will be converted into a flying field in connection with the extension of the University of Texas radio school, and negotiations are under way for the university to take over St. Edward's College and convert it into an air and artillery radio operators' school, capable of handling 1,000 men.

Roe, Missing U. S. Flier, a Prisoner in Germany

London, Aug. 7.—Ensign O. N. Roe, of Massachusetts, a naval aviator reported missing since May 30 when his seaplane broke down off the Dutch coast after being attacked by five German planes, is a prisoner in Germany, according to a letter received from him today. He said two of his companions were killed. He was in the water a half hour, while the Germans fired at him, but was unwounded. The letter adds:

"I've been shifted about and am at Landschut now, from where I expect to go to a permanent camp. There is an American flier here, also a Royal Naval Air Service chap.

Quentin Roosevelt's Grave Found By Comrade

With the American Army on the Vesle, Aug. 7.—On a wooden cross at the head of a grave at the edge of a wood at Chamery, east of Fereen-Tardenois, is this inscription:

"Lieutenant Quentin Roosevelt, buried by the Germans."

German newspapers announced several days ago that Lieutenant Roosevelt, who disappeared during an aerial combat on July 17, had been buried by the Germans at Chamery, but until today the grave was not discovered. It was found by an American aviator. The inscription is in English.

The official American statement on Aug. 2 said: Last night our aviators successfully bombed the railroad station and yards at Conflans. Numerous hits were made, causing several fires and one large explosion. All of our machines returned.

The following is authorized by the Secretary of War dated August 5, 1918: On August 3, our aviators shot down four hostile aeroplanes.

Harvard Flier a Prisoner

A cablegram has been received from the International Red Cross saying that Lieut. Joseph Mellen, Ninety-sixth Aero Squadron, had been in a German prison camp since July 12.

He is twenty-four years of age and a graduate of Harvard. He got the Croix de Guerre in 1915, when driving an ambulance in France. He came back to this country when the United States entered the war and joined the flying service. He was one of the six fliers chosen for the first American bombing expedition over German territory on June 14. His brother, Chase Mellen, Jr., is a lieutenant in the Twenty-third Infantry.

New Florida Air Field to Be Named Hiestand

Washington.—A new aviation field at Fort Meyers, Fla., has been named Hiestand Field by the War Department in memory of Benjamin Hiestand, aviation instructor killed last June in an accident while instructing a flying cadet.

The new field will be an auxiliary for Carlstrom and Bell fields, which are located near Arcadia, Fla.

Royal Canadian Air Service

Ottawa.—Hon. A. K. Maclean, Acting Minister of the Department of the Naval Service, announced on August 8 the formation of the Royal Canadian Air Service. This organization will come under the direction of the Naval Department, and has for its primary object the defence of Canada's coasts, but men enlisting in the Air Force will be liable for service outside the Dominion if necessary. Candidates accepted for the Royal Canadian Air Service will be entered as cadets, and will be required to sign on for three years, or for six months after the duration of the war.

It was stated at the Department today that pilots for seaplanes, aeroplanes and kite balloons were required immediately in connection with the organization. Only young men, British-born, or naturalized British subjects, between the ages of 17½ and 26, and in the highest medical category, will be accepted, and arrangements have been concluded with the militia authorities under which accepted candidates will be released for service in the Royal Canadian Air Service. Seaplane cadets, it is stated, will be trained in the United States this winter, and airship cadets will be sent to England for training.

The Naval Department is now open to receive applications from young men with the necessary qualifications who wish to enter as pilots in the air service. Applications should be made on the forms supplied for the purpose, which may be obtained by writing to the Recruiting Secretary, Department of the Naval Service, Wellington street, Ottawa. The department requires that applications shall be accompanied by a copy of the candidate's birth certificate, a recommendation as to character from some responsible adult, and a doctor's certificate as to medical category. Instructions will be given by the department as to the nearest doctor for purposes of medical examination, and in connection with this, traveling expenses, where necessary, will be refunded.

Wright Field Closed

Dayton, Ohio.—Wilbur Wright Field, as a flying school for aviation cadets, has been discontinued. The field will be used as an armorer's school.

D'Annunzio Flight Sets New Record

Washington.—The Italian Embassy received on August 10 details of the sensational flight of eight bombing planes over Vienna in a despatch from Rome, saying:

"The flight of Gabriele d'Annunzio over Vienna was to have taken place several days ago and was delayed on account of the poet's slight illness. It has now taken place with happy results. The flight was made over the barrage zones at an altitude of more than 15,000 feet.

"The Italian machines, under the command of d'Annunzio, made the flight at an average of 15,000 feet, covering a distance of 700 kilometres each way, a total distance of slightly more than 800 miles in sixteen hours. The poet was most enthusiastic over the idea of flying to Vienna, realizing the enormous moral importance of the feat. More than 1,000,000 manifestoes were dropped on Vienna, being intended to acquaint the Austrian people with the real situation at the front."

"We Italians," the manifesto declares, "do not make war on women, children and old men—only on your blind, obstinate, cruel government, which cannot give you either peace or bread, but feed you on hatred and illusion.

"You have the reputation of intelligence. Why have you donned the Prussian uniform? It is suicide for you to continue the war. The decisive victory promised you by the Prussians is like the bread from Ukraine: One dies while waiting for it. People of Vienna, think of yourselves. Awake!"

The flight is said to be a long distance record for a squadron of planes. One of the machines did not return, and is thought to have been forced down in hostile territory by engine trouble.

Device Aids Altitude Trips

Chicago, Aug. 10.—Tests of the new oxygenizing apparatus for aviators in high altitudes made here have brought unusual results, according to an announcement today by Albert C. Clark, a State Senator, producer of the device.

Senator Clark has ascended with Lieut. Jack Foote and attained an altitude a mile higher than the 11,642 feet which Lincoln Beachey reached in August, 1911.

Senator Clark said the apparatus weighs about three pounds and regulates automatically the supply of oxygen according to the altitude.

Aviators Fly 2,000 Miles

London, Aug. 10.—Two Royal Air Force officers, with two mechanics, have completed a flight from England to Egypt, a distance of 2,000 miles, in a type of aeroplane that has seen considerable service on the front.

Gives Home for Wounded Fliers

Mrs. William E. Corey has given her French home, the Chateau Villeggenisse, near Paris, to the American Red Cross, as a convalescent home for wounded American aviators, it was announced by Lawrence Harris, aid to Major James H. Perkins, Red Cross Commissioner to Europe. The chateau is located in the midst of 200 acres of gardens. It was once the home of Jerome Bonaparte.

American and British Air Tour Arranged

The American and British air tour will start at Washington and take in cities in various sections of the country.

Cities to be visited by the American and British aviators have been selected and approximate dates determined upon. Unfavorable weather conditions may cause alteration of some of the dates.

Maj. C. K. Rhinehardt, U.S.A., will be in command of the party, which will start from Washington. The guest of honor will be Brig. Gen. Charles F. Lee, G.M.G., veteran British aviator, now head of the British aviation mission to the United States. In the party will be several other British and American aviators. Flights and lectures will be given at the cities visited.

The cities with the approximate dates follow: Cincinnati, August 14; Dayton, August 15; Columbus, August 16; Cleveland, Aug. 17-18; Toledo, 19; Detroit, 20-21; Indianapolis, 22-23; St. Louis, 24-25; Kansas City, 26-27; Des Moines, 28-29; Minneapolis and St. Paul, September 1-2-3; Milwaukee, 4; and Chicago, September 5-6.

Kenly Flies to San Francisco

San Francisco.—The aeroplanes bearing Maj. Gen. William L. Kenly, director of military aeronautics, and Lieut. O'Neall, his aid, arrived from Mather field, Sacramento, at noon on August 1st.

New Balloon Pilots' School

Secretary Daniels announced last night that the Navy Department contemplates establishment of an additional training school for balloon pilots.

The school probably will be located at some point east of the Mississippi and south of the Ohio River.

Belgian Ace of Aces Decorated By King

The Belgian ace of aces, Sublieut. Coppens, who has destroyed twenty-one German war balloons in the last three months, has been honored by King Albert of Belgium, who conferred upon him the rosette of Officer of the Order of the Crown and the cross of Knight of the Order of the Crown.

A despatch to the Belgian legation said King Albert in person, in the presence of many pilots and officers lined at attention before many aeroplanes in battle formation and a battalion of infantry, pinned the decoration on Coppens' uniform and congratulated him in a brief speech.

Coppens is the son of a well known Belgian artist, Omer Coppens.

Fixes Rank of Officers

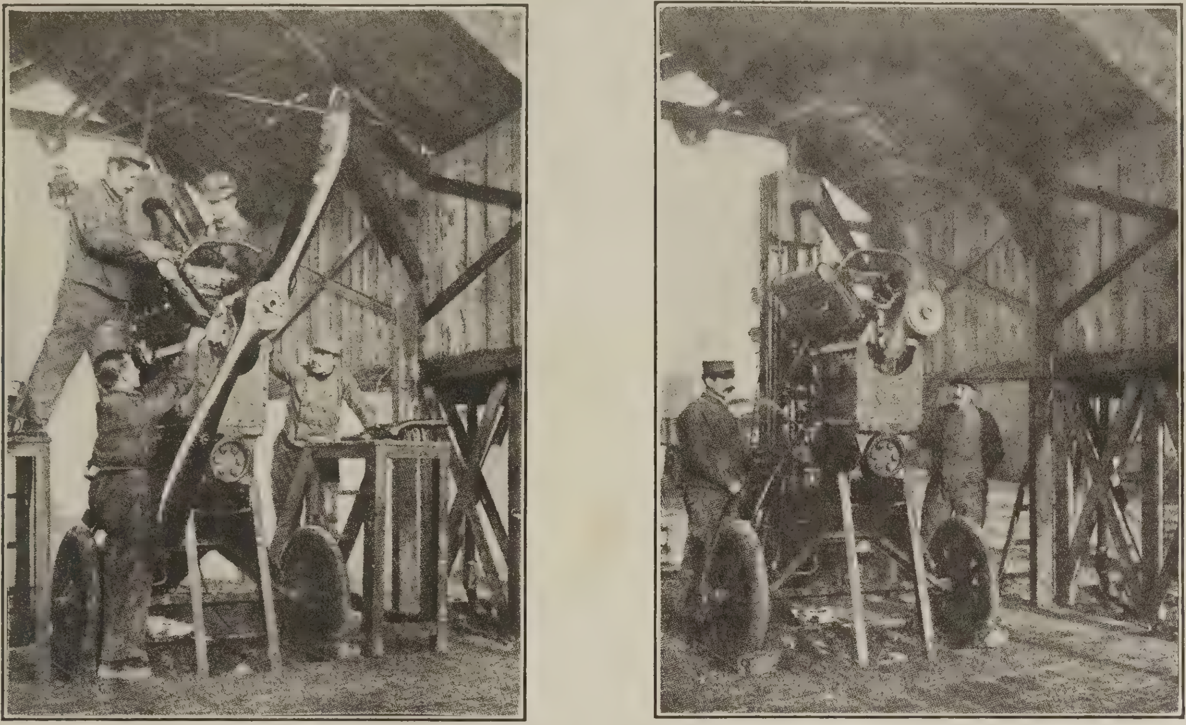
A bill introduced August 5 by Senator Chamberlain at the request of Secretary Baker, provides that when two or more officers of the same grade are on duty one may be appointed to command without regard to seniority of rank in the same grade. In the absence of such assignment officers of the same grade would rank as follows:

First, officers of the same grade in the Regular army and marine corps; second, officers of forces drafted or called into service and third, officers of volunteer forces.

(*Continued on page* 1128)

Mr. Harry Bowers Mingle, president of the Standard Aero Corporation, presenting American flags to the Aerial Mail pilots

The list comprises Max Miller, former flying instructor at San Diego, Cal., 1,000 hours in the air; Maurice A. Newton, Brooklyn, N. Y., experimental flier and instructor, 1,100 hours in the air; Robert Shank, military flying instructor, Dallas, Tex., 1,200 hours in the air; Ed. V. Gardner, advanced flying instructor, Dallas, Tex., 1,400 hours in the air; V. P. Hollingsworth, military flying instructor, Dallas, Tex., 1,000 hours in the air. Reserve fliers, E. Leroy Langley and L. B. Boldenweck.



Two Hispano-Suiza motors being tested at one of the French aviation centers

DEVELOPING THE HISPANO-SUIZA MOTOR FOR THE AIR SERVICE

Story of the Invention of This Engine by a Swiss Engineer Widely Used by the French

By GEORGE H. HOUSTON

President and General Manager, Wright-Martin Aircraft Corp.

PERHAPS the most interesting achievement in the stupendous manufacturing expansion of this country during the past year lies in the field of aviation, motor, and plane construction. Behind the romance of the flying man who fights lies the ability of the great plants throughout the United States that are the backbone of the air programme.

Considered as an industry in which there is no precedent for the judging of standards, it is really remarkable that, inside of fifteen months from the declaration of war, our production should have reached the figures that are now being officially announced.

Unfortunately for us, as a nation, we did not take aviation, motor, and aeroplane development and construction quite as seriously as some of our allies, with the result that, when forced into the war, we found ourselves the parent of an orphan child, farmed out with distant cousins for its education and upbringing.

Born of us, in the persons of the Wright brothers, but sent away at a tender age, our knowledge of the infant was nearly all theory, and there was much for us to learn. As a great nation it was most embarassing. As a people, it was mortifying to realize that we had no great aeroplane motor as our contribution to the winning of the great cause abroad.

Considering the wonderful potential manufacturing resources of the country, there were two things for us to do: (1) Select a motor of recognized and accepted performance abroad and it into immediate production; (2) evolve from the designs of our best engineering talent a motor that would fit into the air programme of our allies and relieve them of a burden at a sorely trying time.

Our answer to the first has been the Hispano-Suiza; to the second, the Liberty, with which everybody is familiar. In deciding upon the Hispano-Suiza we have selected what is said to be the best aeroplane motor yet developed in France and upon which practically all the best known French motor builders are concentrating. The story of the engine and its designer is interesting. In the late 90's Marc Birkigt graduated from one of the best engineering schools in Switzerland and entered into the employ of a mining company near Barcelona, Spain. His ability seemed to lie in the designing of intricate mining machinery, rather than in internal combustion engines. Yet one of the officials of his company persuaded him to work out a design that would meet the severe strains of Spanish roads, and he consented to do so. It was understood that he was to supervise the construction of seven from his own design, which were to be mounted on chassis for the several officers of the company. They proved such a great success that the first one was presented to the King of Spain, whose interest immediately resulted in the erection of a factory for the commercializing of the car, under the name "Hispano-Suiza" (Spanish-Swiss).

In the early part of 1906 the Hispano-Suiza car attracted the attention of M. Charles Faroux, one of the best known French motor-car engineers, who urged Birkigt to manufacture in France for the French trade. A plant was started near Paris, and production began in a small way.

Motor racing was then in its heyday, and Birkigt and Faroux entered the comparatively small Hispano-Suizas with great success.

With the coming of the great war, in the summer of 1914, the sales outlook was indeed dark, and convinced that the wave of patriotism sweeping over France just then would not accept a Swiss-designed car controlled by Spanish capital, Birkigt closed down the Paris plant and went to Spain and tried to busy himself with production there until the end of the war, leasing the French factory to the Gnome Company, who were building their well known rotary type of motor for the French Air Service. The fact was that practically every French motor-building company was then producing only rotary motors, including Le Rhone, Renault, Lorraine-Dietrich, etc.

To fill in his spare moments, Birkigt designed a "fixed" (non-rotary) aviation motor, eight cylinders, water-cooled, and extremely light for its 150 horsepower. Its bore and stroke were 4 11-16 inches by 5½ inches, respectively, and its first trials in Barcelona were successful.

It was at this time that the French Government was in need of fresh impetus in the air, and Major Martinot-Lagarde, a well known army authority, together with several other officers, was ordered to Barcelona to watch the demonstrations. Their report recommended the immediate adoption of the engine if certain endurance tests could be successfully passed.

The result of these tests was another success, and large orders were then placed by the French Government, which more than taxed the capacity of the French and Spanish plants —making necessary the sub-contracting for 450 in the United States to a company organized here for that purpose.

The success of the French Air Service on the western front was immediate.

It was only on May 19 last that Lieutenant Fonck, the premier French "ace," brought down six German planes and the second day following three more. He was using a Hispano-Suiza motor.

At the present time there are, or have been, nearly 50,000 of these motors in the French Air Service. There are seventeen French, two English, and one American plant turning out these motors, and it is a monument to Engineer Birkigt's ability that the foreign motors and parts, from whatever plant, are absolutely interchangeable.

When compared with the now well known German Mercedes, it is found to have 500 less parts, and the raw material weighs at least one-third less, important factors in first costs.

Of the fixed motors, France has used the Hispano-Suiza in its several sizes almost exclusively in her lighter machines, the fast Spad types, and the one and two-seaters of the combined fighting and observation sort. The new 300-horsepower Hispano-Suiza will undoubtedly be used in the day bombing planes, where speed and quick climbing ability are combined with a very certain weight-carrying capacity.

An Austrian flying boat captured by the Italians

Missing Aviator Returns Safely

Paris.—Rumors of the disappearance of Lieut. William T. Ponder of Texas, an aviator, have proved groundless. Ponder was forced to land during a reconnaissance over the German lines because of engine trouble and for a time was unable to rejoin the French flying section to which he was attached temporarily. He turned up two days ago.

Flyer Reaches High Altitude

On Wednesday, July 24th, First Lieut. B. R. Switzer established a new height record for Langley Field. Accompanied by Lieutenant Nietz of the Science and Research Department, Lieutenant Switzer reached a maximum height of twenty-two thousand feet. This feat is the more remarkable because neither Lieutenant Switzer nor Lieutenant Nietz wore oxygen masks, which are invariably worn at altitudes above twelve thousand feet. The time of the flight was one hour and three quarters, the temperature at the maximum altitude was —10 degrees Centrigrade, and the machine was a Curtiss R-4, equipped with a Liberty motor.—*Langley Field Propeller.*

Capital Aviator Gets Third Enemy in France

Following the bringing down of his third German plane after a fight over the German lines, Lieut. G. DeFreest Larner, of the Highlands, has been appointed a flight commander in the American aviation service in France, according to a cablegram received in Washington.

Lieutenant Larner went to France in June, 1917, where he joined the **Lafayette Escadrille.** He joined the American squadron last December and was commissioned lieutenant in January.

In March he received the Croix de Guerre for bringing down his second enemy plane.

Duck Hunting in an Aeroplane

The rich who have time on their hands are on the trail of a new form of sports, although it may be said in its support that men of the aviation corps have a very good argument in its favor as an aid to marksmanship.

This new sport is nothing more or less than hunting ducks by aeroplane, the incentive, of course, being the opportunity for wing shooting against double speed. That is, the machine is traveling at bird speed while the ducks are likewise doing record work.

Nearly a Plane a Day for a Year Downed in Two Weeks in France

Washington.—An account of the activities of the French air service obtained from authentic sources shows that tons of bombs are being rained on the Germans night and day.

During the period of the first two weeks in June, French airmen dropped 600 tons of high explosives on the trenches of the enemy forces, on rest billets, railway stations and on munition plants far back of the German lines.

A total of 27,673 flights were made for military purposes during the period, and more than 2,000 combats took place in the air.

During these combats 199 enemy planes were forced down inside the French lines and 161 other machines were damaged and likely destroyed, making a total of three hundred and sixty enemy planes acount for—nearly one a day for a year, but condensed to a period of two weeks. The French loss during these combats amounted to but 72, twelve of which were only damaged.

In direct aid of the army, the French pilots and observers made 1,159 photographic trips and secured 19,478 snap shots of the German forces and positions. They took 303 long range flights during this period, covering enemy territory for hundreds of miles. This is in addition to the concerted action of the British and American

French observers reported on July 17 that thirteen enemy aeroplanes fell in the region over which an American pursuit squadron was patrolling and fighting. Within the Ameri- lines it had been considered sure that the Americans had downed eight and possibly nine enemy planes.

Lieut. John McArthur of Buffalo drove down a German two-seater in a fight that began near Dormans, and during which the American pilot flew within 100 feet of the ground, where German anti-aircraft and machine gunners abounded. He returned with several bullet holes in his machine, fired from guns on on the ground.

On the way he encountered eight enemy machines, but fought all of them off and landed safely. McArthur fired 500 shots during his travels. This makes his record three enemy machines brought down.

Five German aeroplanes and one balloon were destroyed by American aviators in the fighting over Dormans, on the River Marne.

Zenos Miller of Wooster, O., brought down a balloon and fought off three Fokker machines. Charles . orter of New Rochelle, N. Y., knocked Charles P. Porter of New Rochelle, N. Y., knocked down a German whose machine fell 1,000 feet. Francis Simmons of New York City, brought down two German machines in the same flight. Arthur Jones from Haywards, near San Francisco, brought down one aeroplane and Ralph O'Neill of N..ogales, Ariz., destroyed a two-seater.

Press Dispatches About American Aviators

With the American Army in France.—While the American troops are adding fresh lustre to their fine record the American airmen also are winning distinction. In fighting German formations, patrolling and machine gunning the troops and transports they well have fulfilled their share of the battle.

Within the German lines in the last two days the Americans have brought down seven enemy machines with the loss of only one of their own. One American airman forced an enemy machine to land behind the American lines and coolly landed beside it and took the German pilot a prisoner. Another American attempted a similar performance, but the Germans had made a slight advance during the night and instead of capturing the German he was taken a prisoner.

Lieut. Walter Avery of Columbus, Ohio, in his second flight over the enemy lines brought down a German machine. He went over to see his capture and found that he had brought down Captain Mainkopf, who asserts he has destroyed fifteen British and French planes and one American. The German was proud of his record until told that he had been brought down by an American. He lost his temper when informed that his opponent was a new pilot.

With the American Army at the Marne.—Six German aeroplanes were brought down by American airmen in a series of magnificently successful sky encounters July 24th.

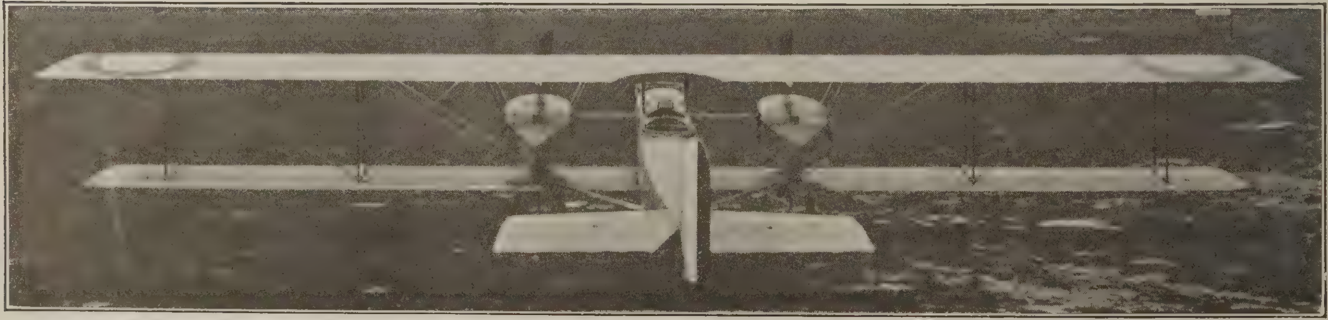
Late in the evening, while patroling north of Chateau Thierry, Lieut. Wilbur T. White, of New York, got lost from his patrol in the clouds and encountered two Albatross machines of the double-seater type. White attacked and saw a tracer bullet enter the head of one of the German pilots. The machine fell out of control. Then, diving, the American fired upon the leading Albatross, the bullets entering the fuselage. The macihne began a spinning nose dive and then crashed.

Six Americans engaged a group of twelve German machines, downing four of them.

With the American Army in France.—Lieut. A. R. Brooks of Framingham, Mass., and Lieut. David E. Putnam of Newton, Mass., of the American aerial forces, report that they brought down an enemy aeroplane behind the German lines at Montsec, the same mountain which obscured Putnam's recent victory from observation and, consequently, official credit.

After daylight on July 23 two German planes, with machine gunners aboard, flying low, attacked an American supply train south of Sergy. They were driven off by anti-aircraft guns.

The Germans later attacked a dressing station. Word of this having been sent to the aerial commander, an American aviator soon arrived and, single-handed, attacked the Boches from above. In trying to get away the Germans collided. The wings of their machines locked and the planes fell, both aviators and gunners being killed.



The Caudron R 11 type of French Bombing Biplane. Twin motored, it carries two and sometimes three men. The nacelle projects considerably in front of the plane thereby insuring a large arc of fire

On the British Front.—American airmen with the British air squadron destroyed approximately thirty German machines recently, many of them being of the new type of Fokker fighting plane. They have accounted, too, for a number of enemy balloons. For the number of Americans engaged and for the short time during which they were fighting against the enemy in company with crack British airmen their record is a splendid one, and no one is more enthusiastic about the work of these airmen than the British commanders of these squadrons, as well as the heads of the air service.

I was given the opportunity to see the stories of the American pilots on the fights in which they had taken the measure of the foe. "They're very brief," said the air force official who showed them to me, and he added: "They have done very well, but they have said very little about it."

In fact, about four lines of typewritten matter in the most undramatic fashion told how one of these Americans had destroyed two enemy machines in the course of a few minutes' fighting when the British patrol, of which he was a part, was suddenly attacked by an overwhelming force of Germans. The fight ended very successfully for the Anglo-Americans.

The same pilot has three Germans to his credit, and several of the others have two each, while many have destroyed one enemy plane each, Some who have beaten German planes also have destroyed sausage balloons.

"I dived from 17,000 to 4,000 feet," said one report, telling how the American pilot had come down from the clouds at a terific burst of speed to destroy an enemy balloon, which blew up like an ammunition dump when his machine gun riddled it as he swept past. Another American pilot had dived at it about the same time, and managed to send several bursts of machine gun fire into it also, as the German observers dropped from it in parachutes.

In still another report an American pilot told how he became sure of his victim by watching him go down very near the earth absolutely out of control, following one burst from his machine gun. British air commanders and pilots have frequently told me latey that the American airmen as well as the British airmen, believe in the attacking policy. If anything they must be restrained, because they are impatient to be scouring the skies all the time.

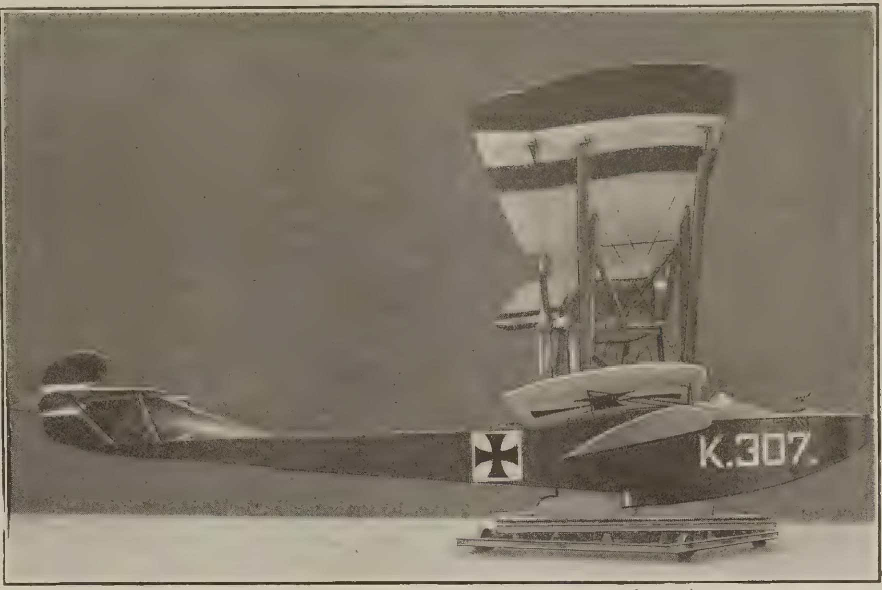
French-English Stenographers Needed for the Air Service

So rapidly has the Department of Military Aeronautics grown, since the reorganization of this branch of service by the Secretary of War, that it already had over 1,000 civilian employees, in addition to its officers and enlisted men.

A call has been issued to the public for thirty (30) additional stenographers and fifty (50) additional typists. A particular need of the Department is for stenographers who are qualified to take dictation in both French and English and make transcription accordingly. Applicacants should call upon or address the Civilian Personnel Officer, Department of Military Aeronautics, Building D, Sixth and B Streets, N.W., Washington, D. C.

Boyau, French Ace, Bags 5 More German Fliers

Paris—Sub-Lieutenant Boyau has gained five additional aerial victories, three of which were won in ten minutes each. His total is now twenty-nine. Lieutenant Madon has increased his string of victories to thirty-eight.



Another view of the Austrian flying boat captured by the Italians

New Aeronautical Books Received

Obtainable through The Aeronautic Library, Inc., 280 Madison Avenue, New York City.

PRACTICAL FLYING, by Flight Commander W. G. McMinnies, R. N. Price $1.60 postpaid.

The first practical work on actual training and instruction for the flying services, covering the whole field, from elementary groundwork to advanced flying. Illustrated with hundreds of diagrams and detailed drawings, also a complete glossary of flying terms and phrases.

AIRCRAFT MECHANICS HANDBOOK, by Fred H. Colvin. Price $3.20 postpaid.

A collection of facts and suggestions from factory and flying field to assist in caring for modern aircraft. It explains the functions of the different parts of the aeroplane in considerable detail, by the use of language readily understood by the average mechanic. There are drawings, together with instructions regarding their care and maintenance. Specifications are given of the several types of training planes which have been approved by the War Department. There are chapters on instruments for aeroplanes and on the Lewis Machine Gun.

HIGH ADVENTURE, by James Norman Hall. Price $1.60 postpaid.

A narrative of air fighting in France, written with vividness, humor and a wealth of human interest.

AIRCRAFT AND SUBMARINES, by Willis J. Abbot. Price $3.75 postpaid.

Within a compass of 382 pages Mr. Abbot has given one of the most complete one-volume presentations of the past and present history of these great war machines. He not only knows his subject, but supplements the text with a very complete series of illustrations in color by John D. Whiting and some photographs.

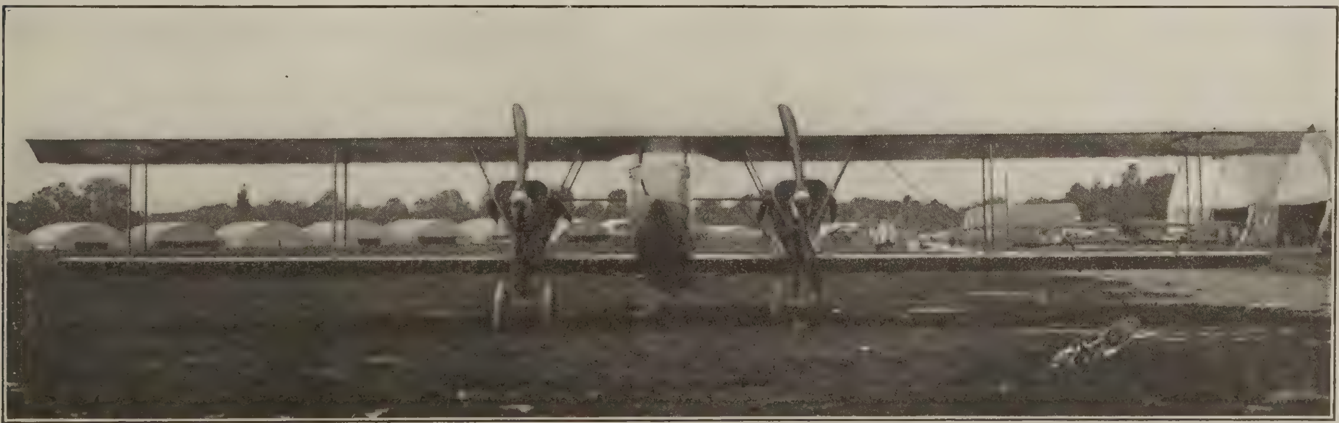
All Aeroplanes With Bombs

With the American Army in England.—Almost every aeroplane used by the Allies soon will carry bombs. Experts in aerial warfare are convinced that the general efficiency of the corps will be increased if a bombing device is added to every plane sent out, even though it be of the type once intended only for scout work, and Americans now training in England are being as carefully drilled in bombing as in handling a machine gun.

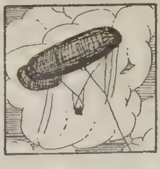
Lessons learned during the recent offensive have served to increase the high regard of both British and American officers in theair service for the low-flying, bomb-carrying craft, and, over the camps and countryside where aviators are being trained, planes are in evidence almost every hour, dipping down and skimming the nearby country, barely missing treetops and houses. It is the newer lesson they are learning, and observers back from the front, where the allied planes did such remarkable work, not only in scouting and distracting the enemy, but actually in breaking up formations and at points checking the onward movement, have urged concentration on that form of training.

British trainers, detailed to American aviation camps, have been liberal in their praise of the new fliers from overseas, their only criticism being that the Americans are "a bit too keen."

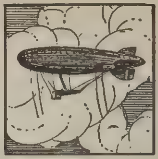
The bombing device being attached to virtually every plane is not the contrivance that was used in the earlier days of the war. The device now being used is one with which the operator may, with much practice, becomes almost as proficient in markmanship as an artilleryman is with his gun. Almost every light plane will cary bombs of at least twenty-five pounds, and from the heavier types there will be hurled the huge containers of high explosives not materially different from those used by the Germans in some of the more recent raids.



A front view of a Caudron R 11 French Bombing Biplane. This machine is a three (3) seater and is driven by two Hispano-Suiza motors and it carries five machine guns



MILITARY AEROSTATICS



By Lieut. H. K. Black, R. F. C., C. F. A.

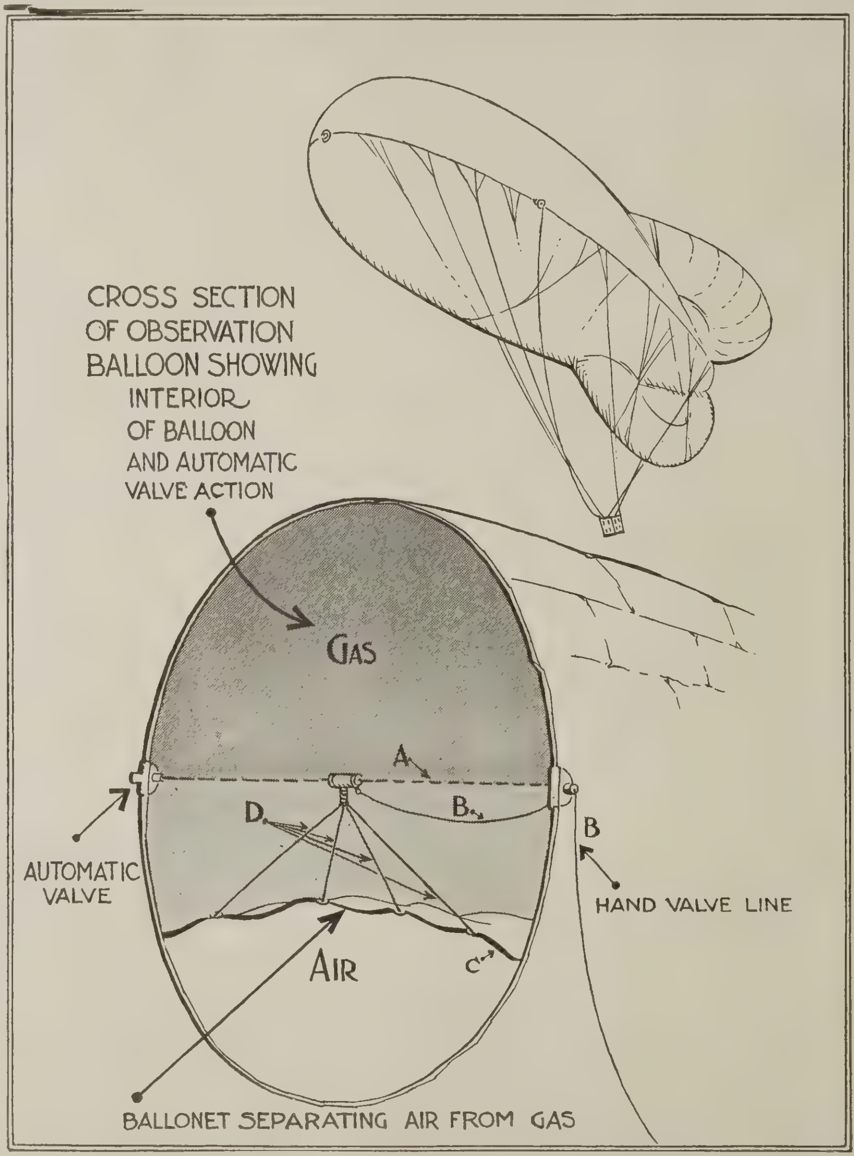
IT is rather difficult to describe in mere words the action of the ballonet in an observation balloon so that there will be a constant internal pressure. The automatic valve action is also a complicated arrangement to explain in words.

Practically it is very simple indeed. It would take only about fifteen seconds to understand it, if it could be seen working. The valve itself, is generally made of aluminum, though sometimes they use wooden valves. In this country the authorities made some inquiries as to whether the metal valve did not make the balloon more likely to be struck by lightning. My personal opinion is that it makes no difference. I must admit that I have not gone into the subject very deeply, but I speak from my own experience.

Wooden valves on the contrary always gave us considerable trouble in France. The weather there is not of the character which prevents warping. Then the wooden valves always leaked to some extent which generally brought a letter from headquarters asking about the increased consumption of gas.

The aluminum valves gave fairly general satisfaction and they could stand a great deal of rough handling, though they looked so fragile.

The illustration given herewith shows a balloon in section looking at it from the bow, at the point where the automatic valve cord runs transversely across the balloon. The reader, I hope, can understand from this just how the valve works. I quite candidly say that the exact arrangement of the lines in a Cacquot balloon is not shown here as, at the present time it is not in the best interests of the Allied cause that this particular detail be shown.


CROSS SECTION OF OBSERVATION BALLOON SHOWING INTERIOR OF BALLOON AND AUTOMATIC VALVE ACTION
GAS
A
B
D
AUTOMATIC VALVE
B
HAND VALVE LINE
AIR
C
BALLONET SEPARATING AIR FROM GAS

The automatic valve arrangement can be easily seen from the drawing. The automatic valve on the left is connected by a cord (A) to a stop immediately opposite to itself. Riding on this cord is an aluminum thimble. The thimble is fastened to a series of spiderleg cords, which in turn are sewn to the upper surface of the ballonet (C). In a previous article the action and function of the ballonet was described. Recapitulating therefore, when the gas in the envelope expands it forces the ballonet downward, thereby keeping the internal pressure constant. At the same time, as the ballonet is forced down, it takes with it the spiderlegs (D), which, in turn draw the aluminum thimble with them. This thimble, riding downward on the automatic valve cord (A) shortens it and the increased tension opens the valve.

As the gas escapes, the internal pressure tends to become less. The pressure of the air in the ballonet, under pressure of the wind entering the rudder, forces the ballonet upward again, the spiderlegs release the aluminum thimble, the automatic valve cord is released in its turn and the valve closes under the pull of its self-contained springs. It sounds quite like a "house that Jack built" story.

The hand valve arrangement is almost too simple to explain. The hand valve line (B) leads from the automatic valve line to the basket of the balloon. When the observer pulls the hand line the valve opens of course.

The hand valve line is very seldom used except in cases of emergency when the balloon has broken away and is in reality a "free" balloon floating with the wind. In a case of that kind, the balloon breaking its cable of course releases a lot of weight and the balloon rises rapidly. To bring the bag to earth again, gas must be released, and by the judicious use of ballast and the hand valve line, the landing is made the same as in the regular free balloon training.

Another device, which is unfortunately not shown in the illustration, for use in emergencies is the rip panel. This is a sheet of fabric cemented, and sewed in with only one row of stitches, at the top of the balloon near the bow. A line connects it with the basket. In the case of a break-away, when the balloon is drifting with the wind toward the Hun lines, about all the observer can do is to throw his instruments and maps overboard and jump over with his parachute. There is a chance that he may pull this rip cord, tear the rip panel out and then jump. This will bring the balloon down in our own lines in many cases, as the gas escapes and the balloon commences

(*Continued on opposite page*)

PERMANENT AERIAL MAIL SERVICE GREAT SUCCESS

THE permanent Aerial Mail Service inaugurated August 12 is a great success.

The Postal Service, directed by the able and energetic Second Assistant Postmaster-General Praeger and Captain B. B. Lipsner, the superintendent of the Aerial Mail Service, is a real asset to the country.

The aviators are all civilian experts:

The list comprises Max Miller, former flying instructor at San Diego, Cal., 1,000 hours in the air; Maurice A. Newton, Brooklyn, N. Y., experimental flier and instructor, 1,100 hours in the air; Robert Shank, military flying instructor, Dallas, Tex., 1,200 hours in the air; Ed. V. Gardner, advanced flying instructor, Dallas Tex., 1,400 hours in the air; V. P. Hollingsworth, military flying instructor, Dallas, Tex., 1,000 hours in the air. Reserve fliers, E. Leroy Langley and L. B. Boldenweck.

The first trip of the permanent aero mail service was made on August 12. The weather in Washington was fair and about 2,000 people, including many officials and aeronautic authorities went to College Park, Md., to the new aerial mail station to see the start. The mail comprised over 285 pounds of letters and papers and included several thousand letters sent by the Aero Club of America, the Aerial League of America, AERIAL AGE WEEKLY, *Flying* and *Air Power*.

At Belmont Park the weather was bad, but the start was successful. The mail was carried from New York to Philadelphia by Robert Shanks. He had a very successful flight.

The storm caused the landing of pilot Newton while flying from Philadelphia to New York.

In a heavy storm, 2,000 feet in the air, Newton's engine went dead when he was within two minutes of landing with his mail at Belmont Park. He landed in a ploughed field. His machine ran its nose in the soft earth and turned over. Newton escaped from the wreckage unhurt.

The accident was the first on the New York-Philadelphia leg of the air mail route and the first interruption to service at this end in six weeks. Not a flyer has been injured since the route was opened in May.

Aero Mail Record for July

The July record of the Aero Mail Service, as shown in the monthly report of Second Assistant Postmaster General Praeger, surpasses that of June. During July out of 108 possible flights 98 perfect flights were made, without interruption through forced landings or mechanical troubles. Only 2 of the 108 legs were defaulted on account of weather, and only 8 forced landings were made. Four of the forced landings were by an officer new in the work and the route.

The flights during the month covered a total of 11,855 miles.

The best performances made by aviators were in the order following:

Lt. J. C. Edgerton, 18 perfect trips with a total of 2,430 miles, without a single interrupted flight.

Lt. Walter Miller, 10 perfect trips with an aggregate of 1,710 miles, without a single interrupted flight.

Lieut. E. W. Killgore, 16 perfect trips, aggregating 2,160 miles, and one interrupted flight, and our uninterrupted flight.

Lt. H. P. Culver, 14 perfect flights, aggregating 1,350 miles, and one interrupted flight.

Lt. T. H. Webb, 12 perfect flights, aggregating 1,080 miles, and one interrupted flight.

During the month all mail speed records were broken when on July 29th the mail was carried from Washington to New York in two hours and five minutes' flying time.

Storm flying records were established when Lieutenants Edgerton, Bonsal and Killgore put their machines through driving rain and wind storms that practically shut out visibility, flying entirely by compass and making perfect landings. On the New York-Philadelphia end, several flights were made by Lieutenants Miller, Culver and Webb through fog, haze and rain.

Leg from Washington to Philadelphia. 135 miles
Leg from Philadelphia to New York... 90 miles

(*Continued from opposite page*)

to fall within about ten or fifteen seconds. I have never tried it, but that is what we were told. When the balloon falls that way, it is very likely to overtake the observer in his parachute and, falling on the parachute destroy the observer's chances of landing safely. The practice of ripping before jumping was never advocated.

In a free balloon flight the rip panel is also used to deflate the balloon rapidly when landing. I have also known cases where the rip cord was pulled when the balloon became unmanageable in a high wind on the ground.

The illustration shows the panel construction which was mentioned in the previous article.

(*To be continued.*)

Performance of Aviators During Month of July, 1918

Total possible number of flights	108
Total possible mileage	12,150
Total perfect (uninterrupted) flights made	98
Total interrupted flights made	4
Total flights defaulted on account of weather	2

Pilot	Perfect Flights		Interrupted Flights		Uncompleted Flights		Total Flights	
	No.	Miles	No.	Miles	No.	Miles	No.	Miles
Lt. J. C. Edgerton	18	2,430	..	...	..	...	18	2,430
Lt. Stephen Bonsal	10	1,215	..	...	..	...	10	1,215
Lt. E. W. Killgore	16	2,160	1	135	1	65	18	2,360
Lt. Walter Miller	19	1,710	..	...	..	...	19	1,710
Lt. T. H. Webb	12	1,080	1	90	..	...	13	1,170
Lt. H. P. Culver	14	1,350	1	135	..	...	15	1,485
Lt. Gordon Dodge	9	1,035	2	225	2	225	13	1,485
Total	98	10,980	5	585	3	290	106	11,855

Aerial Mail Operation for the Month of July

Date 1918	Miles Flown	Hours of Flying		Mail Carried		Percent of Performance	Arrival	
		Hrs.	Min.	A.	O.		Wash.	N. Y.
	1.	2.		3.		4.	5.	
1	270	3	42	39	220	50%	4.37	6.15
2	450	6	26	51	710	100%	5.05	3.30
3	450	5	27	40½	615	100%	3.05	2.44
4	450	6	05	37½	158	100%	4.25	3.15
5	443	5	52	37	698	75%	4.00	3.05
6	450	6	00	51½	696	100%	3.25	2.40
8	450	5	51	40½	402	100%	3.35	2.20
9	450	5	57	34½	674	100%	3.47	2.12
10	450	5	35	36	677	100%	3.30	1.58
11	385	5	23	39½	675	75%	5.30	2.28
12	450	5	14	40½	659	100%	2.55	2.32
13	380	4	49	30½	544	75%	3.00	2.25
15	450	5	40	393	493	100%	3.03	2.20
16	395	5	07	37	469	75%	3.26	2.17
17	450	6	01	51	764	100%	3.35	2.11
18	450	5	45	47	554	100%	3.00	2.28
19	450	5	51	46½	621	100%	2.55	2.46
20	464	6	18	43½	503	75%	4.17	2.50
22	450	6	13	47½	590	100%	3.36	2.18
23	450	6	34	47	635	100%	3.45	2.41
24	450	6	04	43½	645	100%	3.26	2.25
25	450	5	57	39	653	100%	3.28	2.18
26	450	5	49	41½	639	100%	3.04	2.36
27	450	5	53	39½	656	100%	3.10	2.40
29	450	6	09	45½	526	100%	4.17	2.15
30	450	6	47	46½	582	100%	4.40	2.25
31	383	6	05	30	433	75%	3.00	2.46

Note: Number of hours dead flying for month, 19 hrs. 3 min.

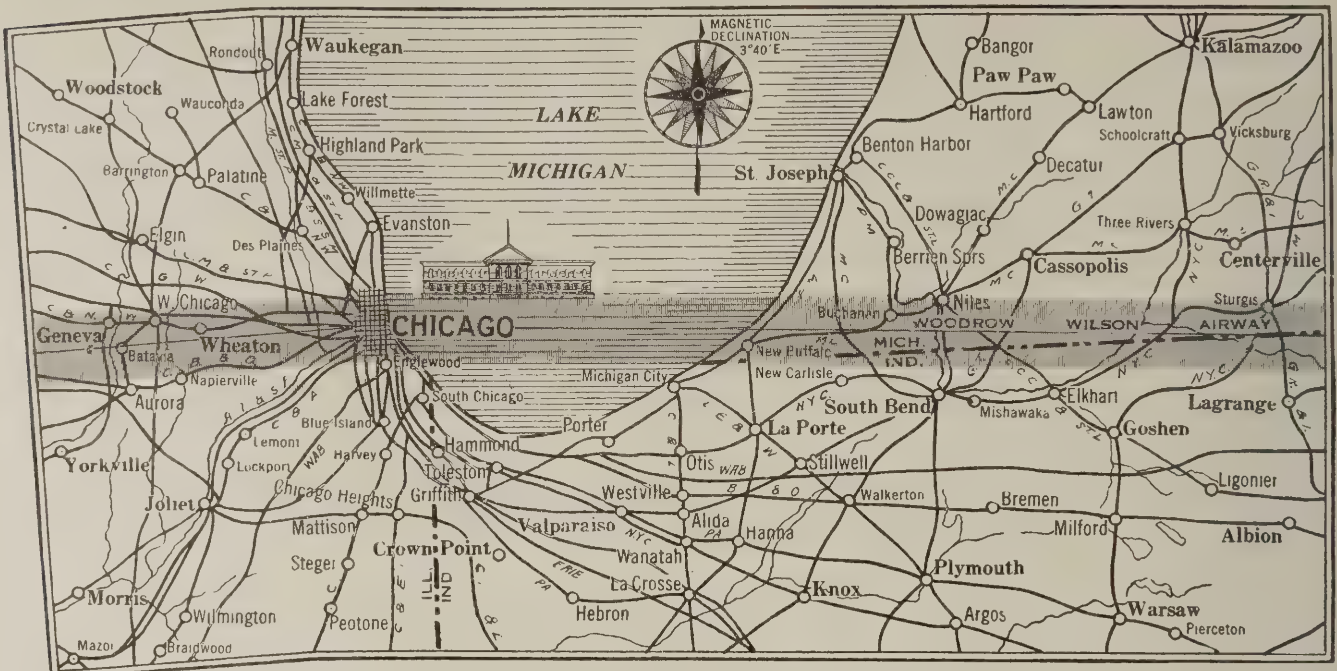
Explanation of Tabulation:

1. **Miles flown:**

Leg from Washington to Philadelphia.......135 Miles.
Leg from Philadelphia to New York....... 90 Miles

Miles flown for the day, whether one, two, three, or four legs of the trip have been made. The aim is to get exactly the number of miles flown in connection with the mail service each day. Therefore, mileage of partial trips should be indicated.

2. **Hours of flying:** To include the actual hours and minutes machine is in the air with mail.
3. **Mail carried:** In this column, under A., give pounds of aeroplane mail; and under O., give pounds of ordinary mail.
4. **Percent of performance:** Round trip Washington-New York consists of four legs, each leg valued at 25% if completed by aeroplane and not by train before close of day.
5. **Arrivals:** Time plane reaches Washington and New York, or, if train carrier, the scheduled time.



(Map copyrighted by the Aeronautic Maps Association, 299 Madison Avenue, New York.)

Section of the Illinois-Michigan Division of the Woodrow Wilson Airway

WOODROW WILSON AIRWAY MAP COMPLETE

THE map of the Woodrow Wilson Airway has been completed and will be published in the Aero Blue Book, being issued by the Century Company. Copies can be obtained through the Aeronautic Library, 299 Madison Avenue.

The maps, which have been made under the direction of Messrs. Henry Woodhouse, Captain Russell Hastings Millward and Captain Robert A. Bartlett, the famous explorer, comprise 17 sections extending from New York to San Francisco. They have cost $6,000 to make it, exclusive of cost of printing.

The Woodrow Wilson Airway was named after President Wilson last year by the Aero Club of America, when the President signed the $640,000,000 appropriation for army aeronautics.

The Aero Club of America adopted a resolution to establish the Woodrow Wilson Airway, and communicated the resolution to Congressman Hulbert, who was prominent in conducting the campaign for the building of our aerial defenses, requesting that he present the matter to President Wilson. The President's answer was as follows:

"*My dear Mr. Hulbert:*

Thank you warmly for having let me see the enclosed telegram. It heartens me mightily. It is very delightful to have such a feeling exist and to receive such evidences of support and approval.

Cordially and Sincerely Yours,

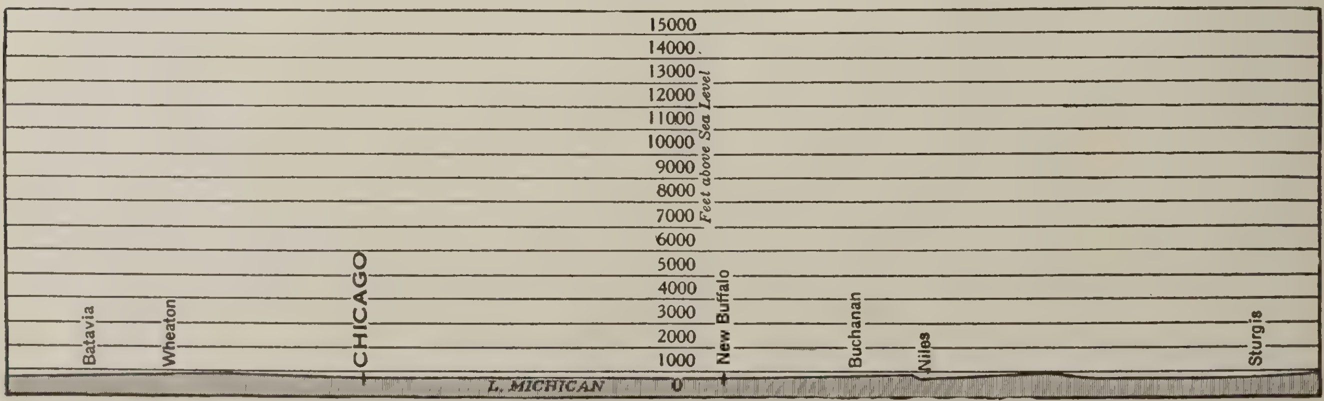
WOODROW WILSON.

The Woodrow Wilson Airway represents a zone eighty miles in width, extending from New York to San Francisco. A line through this zone touches the most important cities, through the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Iowa, Nebraska, Wyoming, Colorado, Utah, Nevada and California.

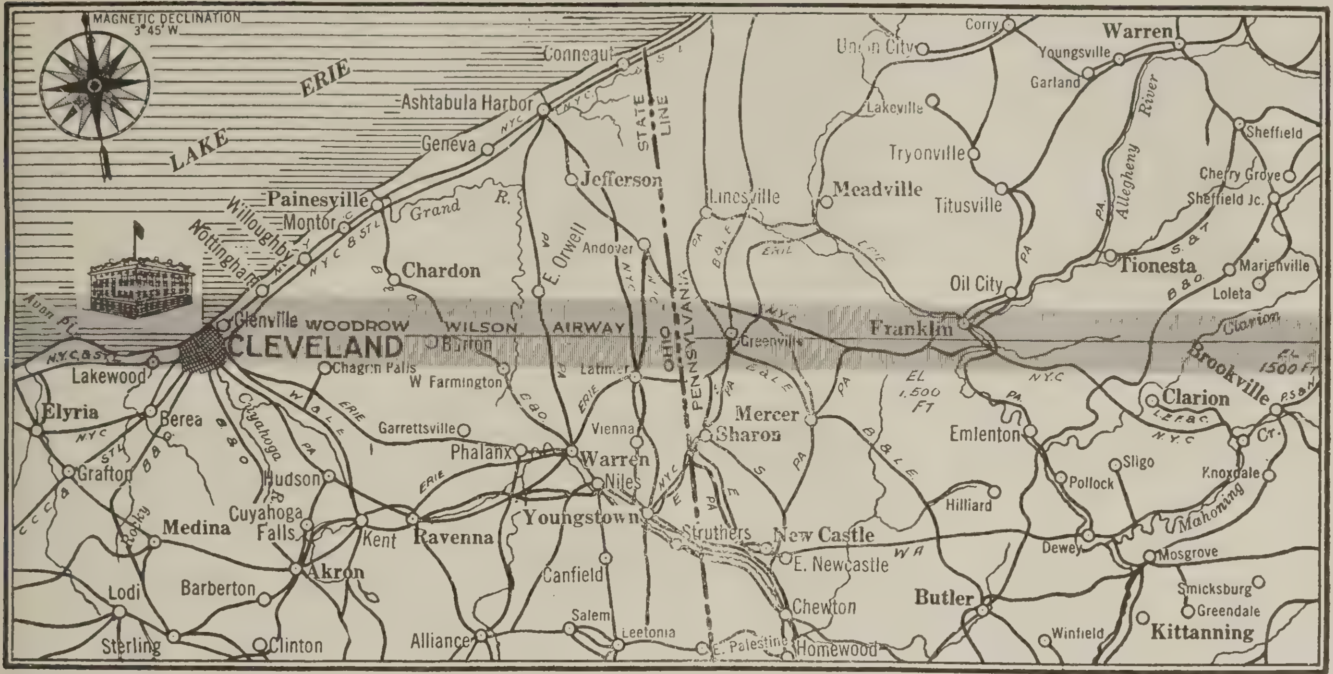
The Airway zone extends forty miles on each side of the line, so the air traveler can reach the extreme part of either side of the zone in half hour flying. Any city or community located within this eighty miles belt will be designated as being on the Woodrow Wilson Airway. Landing places for aircraft and identification marks will be placed first in the important places in direct line of the Airway, then at the approach of every community.

The delivery of the proofs of the Wilson Airways Maps, on August 1, 1918, established a record in the delivery of mail from New York to Washington.

A few minutes before eleven o'clock that morning Post-



One of the charts of the elevation along the Illinois and Michigan Division of the Woodrow Wilson Airway



The shaded line indicates the Woodrow Wilson Airway which comprises a belt eighty miles in width. All cities and communities on this map are designated as being on the Woodrow Wilson Airway, including railroads, mountain ranges and other natural features. At bottom of page elevations along airway. Railroads and national highways crossing and paralleling the Woodrow Wilson Airway: Baltimore and Ohio. Cleveland, Cincinnati, Chicago and St. Louis. New York, Chicago and St. Louis. Pennsylvania. Wheeling and Lake Erie. Erie. Buffalo and Lake Erie. Pittsburgh, Shawmut and Northern. Lake Erie, Franklin and Clarion. Western Allegheny. Sheffield and Tionesta. Lincoln Highway. (Copyright by the Aeronautic Maps Association.)

master Patten's office in New York was notified by Second Assistant Postmaster Otto Praeger of Washington, to call up Mr. Henry Woodhouse and notify him that the Postmaster would like to have by return of mail a set of advance proofs of the maps of the Woodrow Wilson Airway.

Although the message was only received a few minutes before eleven o'clock, Postmaster Patten's messenger called on Mr. Woodhouse at the Aero Club of America, No. 297 Madison Avenue, a few minutes after eleven o'clock, and received the proofs of the Wilson Airway maps and other information, and they were sent by Aerial Mail, leaving New York at 11:30 A. M., in an aeroplane, to arrive in Washington about two and a half hours later.

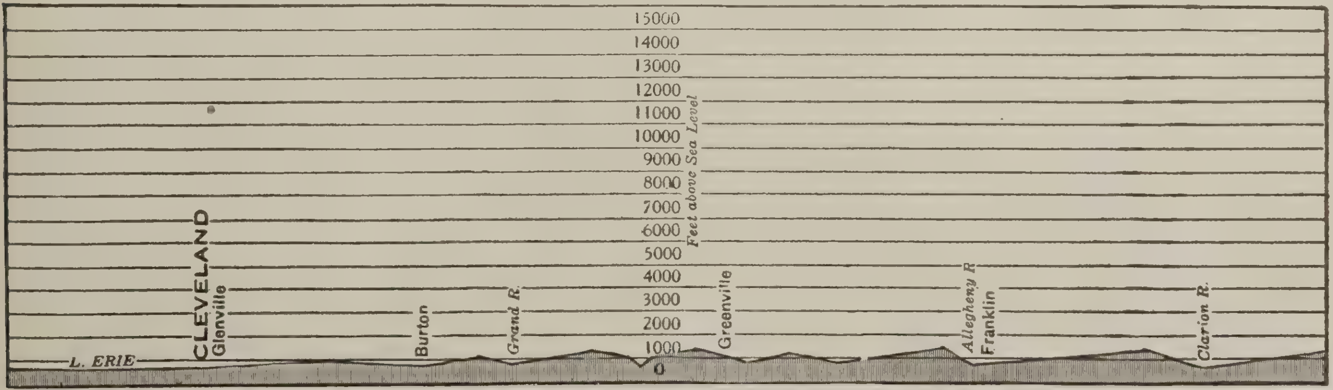
The Woodrow Wilson Airway is a belt eighty miles wide, following the great circle from New York to San Francisco, and crossing the following states: New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Iowa, Nebraska, Wyoming, Colorado, Utah, Nevada, California.

The maps are made especially for the use of aviators and show land marks, elevations and other important things which an aviator must know when he flies.

The Aero Blue Book which is being issued by the Century Company gives the 17 sections of the airway, including the maps, the tables showing the elevations, the scales in statue and nautical miles and kilometres, and the names of the communities included in each section of the Wilson Airway, and the names of the railroads and national highways crossing and paralleling the Wilson Airway, the location of weather bureau stations, magnetic declinations, etc.

It also gives a plan showing what a permanent aerodrome and an emergency aviation field should be, together with other useful information regarding wind direction arrows, and other means of signaling and directing aviators.

It also gives the plans for the employment of aircraft for utilitarian purposes after the war, the plans for other airways and air routes, different kinds of aeronautic maps, the list of a dozen or so of international and national trophies and events to be competed for as soon as the war is over and other similar very useful information, data, and aeronautic records which cannot be found anywhere else.



One of the charts of the elevations along the Ohio and Pennsylvania Division of the Woodrow Wilson Airway. (Copyrighted by the Aeronautic Maps Association, 299 Madison Avenue, New York.)

THE L. V. G. BIPLANE TYPE C. V.

L'Aérophile for April, 1918, contains an interesting description of the L.V.G. biplane, type C.V., a translation of the substance of which is reproduced, with certain illustrations, under a due sense of obligation to the editor of that excellent French technical paper.

Comparative specifications of the L. V. G. biplanes C.II., C.IV., C.V., and Rumpler C.IV.:—

	L.V.G.			Rumpler
	C.II.	C.IV	C.V.	C.IV.
Span (upper wing)	12.85m.	13.60m.	13.62m.	12.60m.
Span (lower wing)	11.35m.	12m.	12.85m.	12.10m.
Total length	8.10m.	8.60m.	8.10m.	8.4m.
Height	3m.	3.10m.	3.20m.	3.25m.
Lifting surface	37.60sqm.	40sqm.	42.70sqm.	33.50sqm.
Weight	845kg.	900kg.	920kg.	1010kg.
Power of motor	175h.p.	235h.p.	225h.p.	260h.p. 250h.p.
Make of motor	Mercédès	Mércèdes	Benz	Mércèdes or Maybach

Note.—I metre = 32.37 inches.
1 sq. metre = 10.75 sq. feet.
1 kilogramme = 2.2 lbs.

The L.V.G. type C.V., which is constructed by the Luft Verkehrs Gesellschaft (Aeronautical Transport Company), is a two seater. It belongs to the "general purpose" class, sometimes known as the Army Corps type.

Less speedy on the flat than the Rumpler C.IV., described in *The Aeroplane* of February 27th, 1918, its rate of climb is inferior (4,000 metres in 35 minutes), and equally its ceiling is less elevated (a little more than 5,000 metres).

Its speeds are as follows:—

At 2,000 metres	164 km. per hr.
At 3,000 metres	160 km. per hr.
At 4,000 metres	150 km. per hr.

THE WINGS

The upper and lower wings are set at a dihedral angle, more so the lower ones.

This dihedral is of 1° to the upper wings and of 2° to the lower. They are neither staggered nor swept back.

The trailing edges of the wings are flexible. The ribs are spaced about .4m. apart, with false intermediary ribs. The incidence of the wings is as follows:—

At 1st and 2nd ribs	4.5°
At 3rd to 9th ribs	5°
At 10th rib	4.75°
At 11th rib	4.5°
At 12th rib	4°
At 13th rib	3°

The upper wings, viewed in plan, are slightly trapezoidal, with rounded edges.

Their chord is 1.74m., and in the centre a semicircular piece is cut out of the trailing edge above the pilot's head.

The ailerons project past the ends of the wings by .34m. Their form is rounded, and resembles that of the ailerons of the Gotha. Their total length is 2.61m. Their chord varies from .53m. inside to .75m. at the projecting portion.

The hinges of the ailerons are parallel with the leading edge of the wing. They are attached by means of pins or bolts threaded through hinge loops, held in place by keys, on the system employed to attach the ailerons on the Roland fighter D.II. The arrangement has the advantage of permitting the quick attachment of the members.

The lower wings, following the present tendency and taper at the rear, as in the D.F.W., Rumpler C. IV., and Albatros C. IV. Their maximum chord is 1.59m.

The aileron cables pass through the interior of the lower wings.

The interplane struts (two pairs on either side of the fuselage) are constructed of streamline timber 105m. in diameter, and tapered towards both ends. By reason of the differing dihedral of German aeroplanes, are rounded at the ends, angles the inside and outside struts are not the same length.

The outer struts are 1.635m. long and the inner ones 1.59m.

The gap between the wings is 1.74m. at the fuselage and 1.66m. in line with the external struts.

The total lifting surface is 42.9 sq. m., that of the upper plane being 23.73 sq. m., and the lower 19.17 sq. m.

The cabane struts are in the form of an "N," inclinded towards the rear, and converging to the fixed centre section of the upper plane, the width of which is .12m.

THE TAIL

The shape of the stabilizing plane, or fixed tail plane, resembles that of the Albatros fighter. At the same time, it should be noted that its leading edge is flatter, and it is therefore not so deep.

The tail plane consists of two separate parts attached one on each side to a fixed section embodied in the fuselage, which like it is constructed of three-ply.

The elevator is a single flap, with rounded corners and balanced by a triangular extension at each end. The greatest width is 3.04m. and the depth .65m. The small triangles have a base of .39m. and are .39m. high.

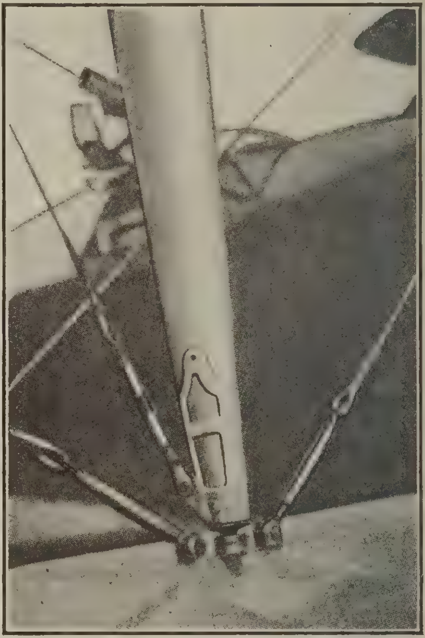
At the outer angel of each of the tail planes one finds a projection of about .020m., intended to eliminate vibration from the tips of the balanced ends of the elevators by screening them from the air blast.

The balanced rudder is placed above the elevator, and forms with the fixed fin an oval inclined backwards.

The fixed fin is constructed of three-ply, and is trapezoidal in shape. The total height of the vertical empennage is 1.068m.; its depth is .675m. (1.15m. including the compensated portion). One finds on the fixed fin a projection in front of the compensating point of the rudder similar to those found on the fixed tail planes.

The internal structure of these members consists of steel tube-work.

The control cables pass through the fuselage, coming outside 1.50m. from its extremity; one pair of the elevator cables pass through a channel in the thickness of the stabilizing plane.



A detail view of a strut socket

The fuselage is entirely built of varnished three-ply, and is rectangular in form, with a well-rounded top, the underside being slightly less rounded. The sides have a slight outward bulge, accentuated at the level of the pilot's seat.

The general lines are not so slender as those of the Rumpler C.IV.

THE POWER PLANT

The L.V.G., C.V., is driven by a Garuda airscrew, type V., with a diameter of 3.04m. The boss of the airscrew is enclosed in a "Casserole," or pot, .58m. diameter.

The motor is a 225 h.p. Benz, also used in the D.F.W. and F.D.H.G. II.

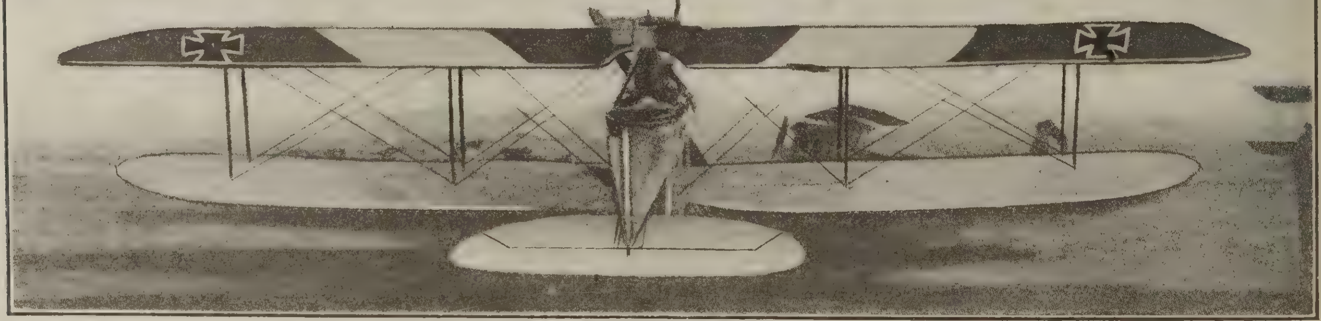
It is fed by two tanks, with a capacity of 249 litres. On the upper left wing is fitted a feed tank. The contents of these tanks permit of a flight of about 3¼ hours.

The upper portion of the motor is entirely covered in with a panelled and removable sheet steel bonnet.

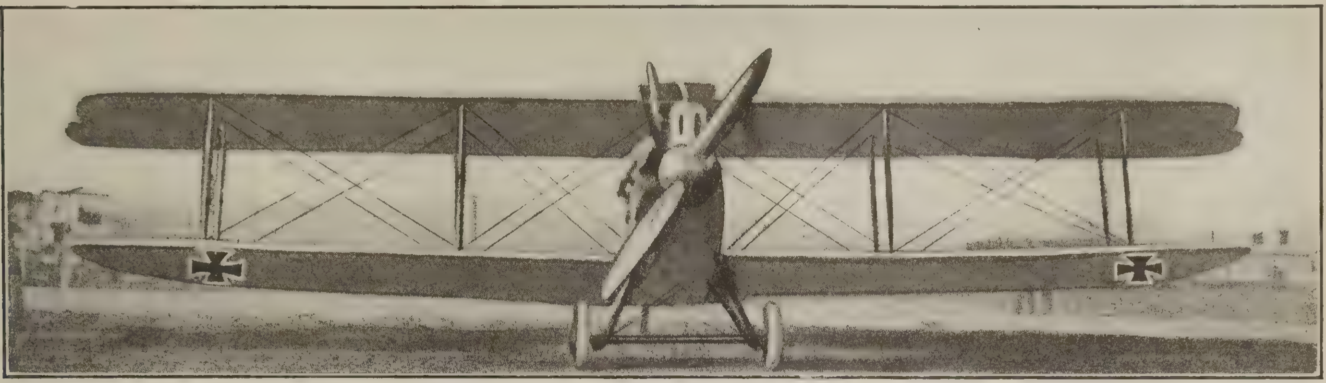
The exhaust is led overhead as in the Rumpler C. IV. Contrary to that machine it is not much curved, but rises nearly vertically. [The drawings and photographs show a slight curve.—Ed. *The Aeroplane.*]

The honeycomb radiator, the capacity of which is 35 litres, is placed in front of the wings. It is rectangular in shape, and is attached to the cabane struts by two brackets. Its upper part is attached to the fixed centre section of the upper plane by a small steel tube fork.

The temperature regulating blind placed in front of the radiator is one of the best in use. It is simpler and more rational than the system of shutters. It consists of a movable blind of strong fabric, which is rolled and unrolled at the will of the pilot, which permits the stoppage of the



Rear view of the L. V. G. biplane: type C. V.



Front view of the L. V. G. biplane: type C. V.

passage of air and the regulation of the cooling. [One commends the idea to the super-elaborators of the R.A.F. Technical Department.—Ed.]

ACCOMMODATION

The accommodation for the pilot is of oval form, the bigger dimension being in the direction of travel.

Very close to this is arranged the passenger's seat inside a turntable .86m. in diameter, which carries a "Parabellum" machine gun.

In front and on the right side is a Spandau machine gun firing through the airscrew, and controlled by a Bowden wire.

Wireless apparatus is installed.

The landing carriage consists of two pairs of streamline "V" struts built of timber, and a pair of wheels 810mm. x 125mm.

The tires are marked "Harburg," Vienna. The wheel track is 1.98m. The axle is placed in a streamline wooden fairing.

The suspension consists of "Sandow" elastic cord.

As in the Rumpler C. IV., a drag cable runs from the front of the fuselage to the base of the inner interplane strut.

The tail skid, which is attached to a small fin underneath the fuselage, is constructed of wood, and is terminated by four steel laminations .002m. thick.

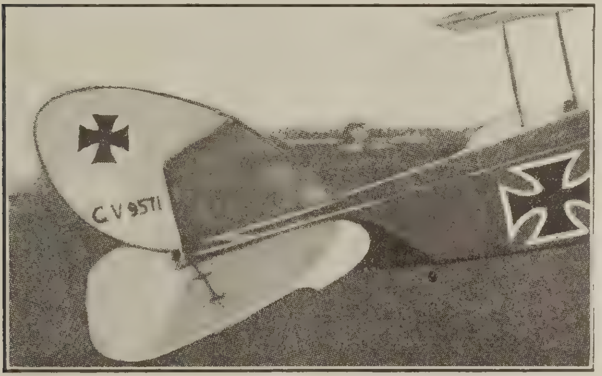
The skid is sprung with elastic cord.

The machine is camouflaged in bright green and mauve on the upper sides of the wings and on the horizontal empennage.

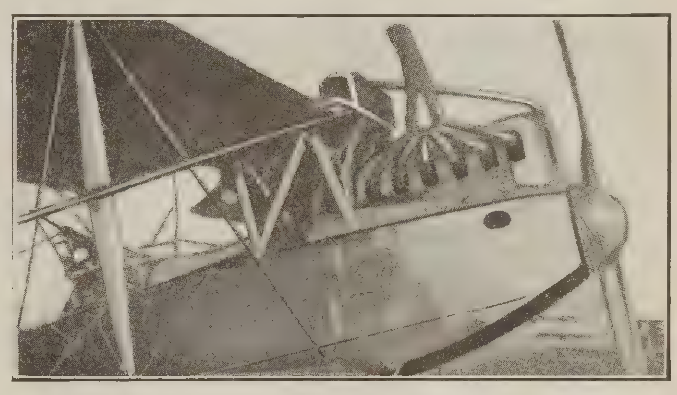
The under sides of these surfaces are bright blue.

In the passenger's cockpit a hole in the floor permits the passage of a camera.

The machine described above was apparently intended for photographic reconnaissance. It carried no bomb-dropping gear.



A view of the tail members



A view of the exhaust manifold

(*Continued from page* 1113)

Brown & Sharpe Mfg. Co., Providence, R. I., 1 universal and tool-grinding machine.

American Bleached Goods Co., New York City, N. Y., 15,000 yards balloon cloth.

The Anderson Chemical Co., Wallington, N. J., 2,000 gallons diacetone alcohol.

Brown & Sharpe Mfg. Co., Providence, R. I., 1 tool-grinding machine and attachments.

American Cellon Co., 887 Fifth Avenue, New York, N. Y., 50,000 gallons cellulose acetate dope.

Napier-Browning Co., 105 West Fortieth Street, Jersey City, N. J., 6100 connectors.

Bell & Howell Co., Candler Building, 220 West Forty-second Street, New York, N. Y., motion picture equipment, cameras, lenses, etc.

General Radio Co., 11 Windsor Street, Cambridge, Mass., 2500 receiving sets.

Geo. H. Amick, Clendenin, W. Va., 50,000 feet walnut lumber.

Guy Leonard, Baltimore, Md., services as supervisor of construction and operation of plants manufacturing acetate of lime and other chemicals.

Western Electric Co., 463 West Street, New York City, 280 amplifiers, 300 transmitting sets.

Murray & Tregurtha Co., 340 West First Street, South Boston, Mass., 2 seasleds and motors.

Chemical Products Co., 30 Charles River Road, Cambridge, Mass., 42,000 pounds cellulose acetate.

Champion Ignition Co., Flint, Mich., 15,000 spark plugs.

Simmons Hardware Co., District National Bank Building, Washington, D. C., 5000 gunners' safety belts.

Lewis Thompson & Co., Colonial Trust Co. Building, Philadelphia, Pa., 25,000 feet Mexican mahogany lumber.

Canadian Aeroplanes (Ltd.). Toronto, Ontario, Canada, 150 planes for Curtiss Canadian aeroplanes.

Ericsson Mfg. Co., Buffalo, N. Y., 95 items, spares for Berling magneto D-18, contact springs, screws, interrupter levers, etc.

American Propeller & Mfg. Co., Baltimore, Md., 1000 air fans.

Century Telephone & Construction Co., Buffalo, N. Y., 109 instruction buzzer sets.

Century Telephone & Construction Co., Buffalo, N. Y., 50 instruction buzzer sets.

Russell, Burdsall & Ward Co., Port Chester, N. Y., 37,000 galvanized lag screws.

Contracts were placed by the Ordnance Department of the U. S. Army, as follows:

Remington Typewriter Co., New York; models of bomb release mechanism.

Edward G. Budd Mfg. Co., Philadelphia; aeroplane flares.

Four-Wheel Drive Auto Co., Clintonville, Wis.; spare parts for 3-ton truck, equipment and main shaft for ammunition trucks.

B. F. Goodrich Co., Akron; rubber equipment for heavy artillery repair shops.

Warner Auto Top Co., Cincinnati; pack carriers, breech lock mechanisms.

Nash Motors Co., Kenosha, Wis.; repair parts for Nash "Quad" trucks.

Parsons Scores His Fourth Air Victory

Paris.—Edwin G. Parsons, of Holyoke, Mass., has brought down his fourth officially credited enemy machine.

Parsons has been flying for two years in the Lafayette and Guynemer escadrilles.

A night despatch from General Pershing on the 26th of June said:

"Five American bombing planes raided Conflans last night, dropping explosives upon the railway station. There were good results. One German observation plane was seen but it did not attack. All the American machines returned safely."

Major Harold E. Hartley, of Saskatoon, Canada, is the newest American "ace" as a result of his air victory of June 25th when he landed his fifth German. His other four victories occurred while he was with the British Royal Flying Corps.

Lieut. James A. Shenden of Chicago, who lost his way and landed in Switzerland, is now interned there. His machine was smashed but he was unhurt.

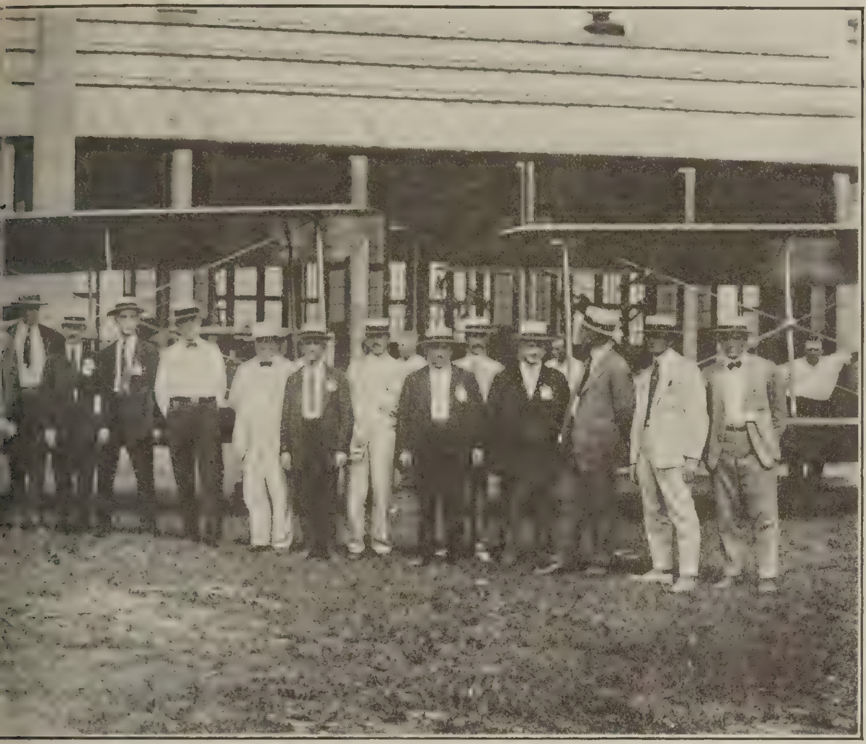
Lieut. W. B. Ponder of Mangum, Okla., has been decorated with the War Cross with the palm for his valor in assisting the French in keeping the aerial vigil over the American troops in the Chateau-Thierry sector.

Lieut. Ponder is attached to a French Flying Squadron. On June 16 he brought down two German planes and with great daring helped to drive off ten other enemy planes.

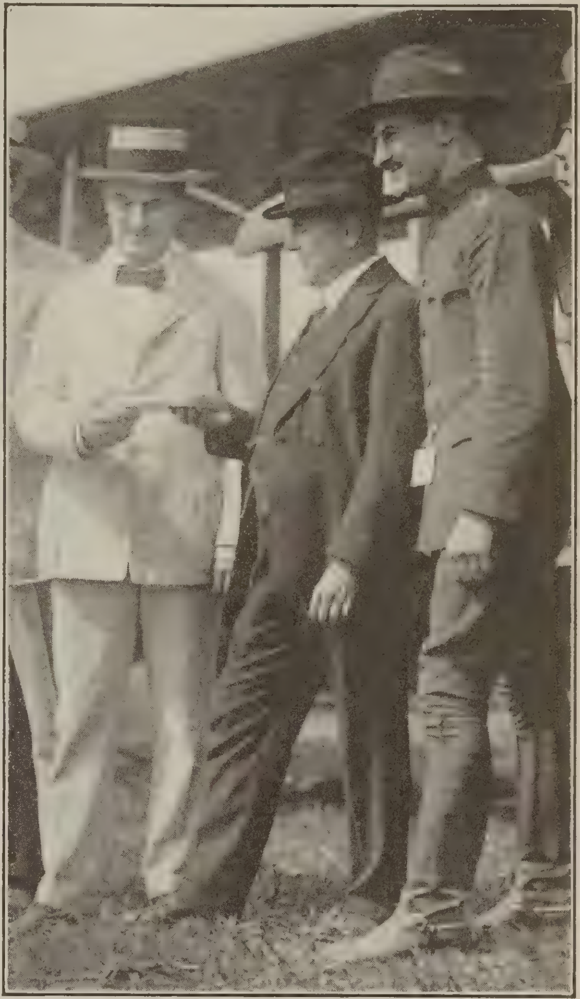
The first of the Standard Aerial Mail planes starting for its initial flight. It started from Elizabeth, N. J., at 6.30 and arrived in Philadelphia forty minutes later. It is equipped with a 150 H.P. Hispano-Suiza

Line-up of postal officials, aeronautical authorities, and officers and heads
Mail planes delivered to the postoffice on August 6th. From left to right:
Service, who brought down 23 Germans while in the British service; Harry
of the Aerial League of America; Henry Woodhouse, Member of the Board
noted engineer of the Standard Aircraft Corporation; Mr. Max J. Finkleste
ica; Mr. Harry Bowers Mingle, president Standard Aircraft Corporation; Ho
superintendent Aerial Mail Division, U. S. Postoffice; Mr. J. A. Edgerton,
poration; Mr. Walter C. Burton, postmaster of Brooklyn; Mr. William F. B
chief assistants; Mr. Leroy B. Gulotta, managing editor of AIR POWER; M
Mr. Praeger; Mr. Benjamin L. Williams, secretary

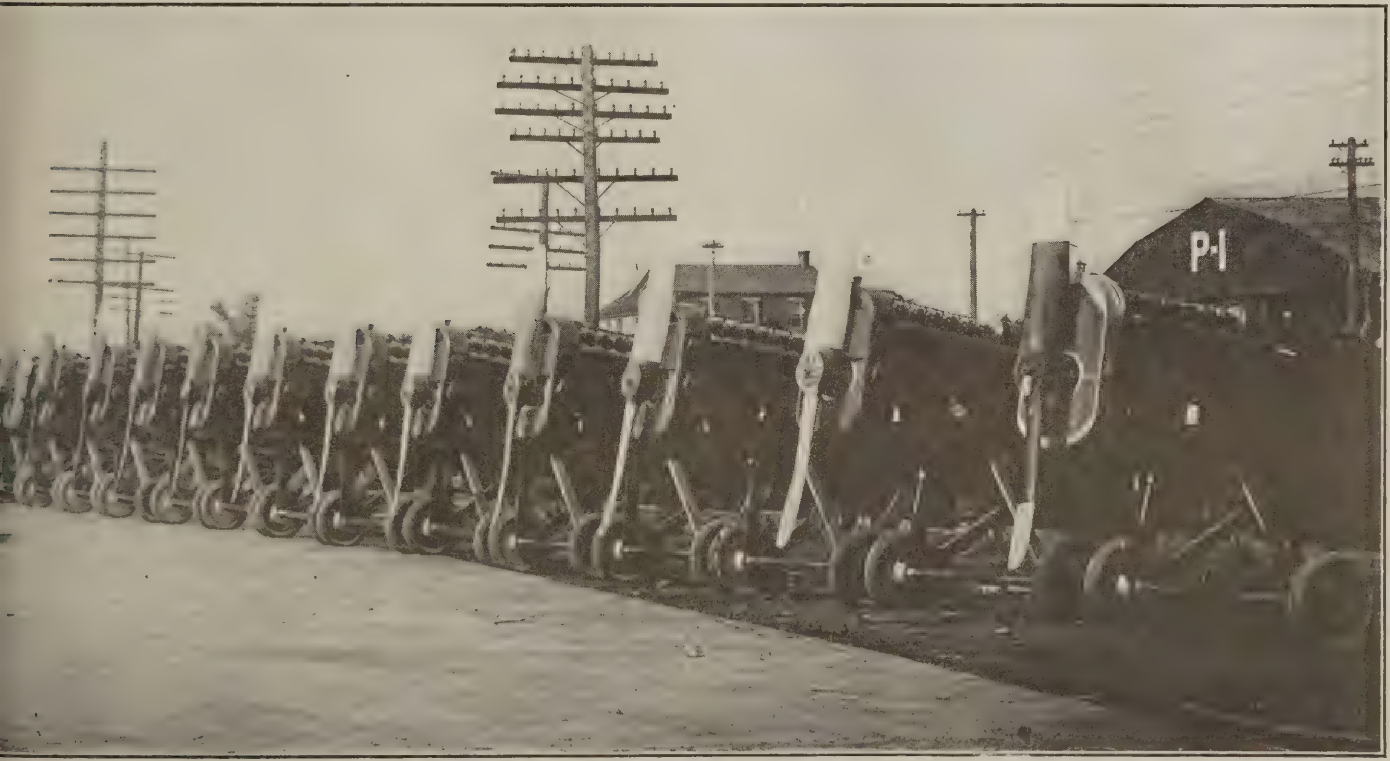
One day's output of the Dayton-Wright Airplane Co., at Dayton. The machines shown on this photograph are the De Havillar
rate of production is increasing constantly. The metal parts



**artments of the Standard Aircraft Corporation in front of the six Standard Aerial
in Robert A. Bartlett, famous explorer; Captain Frederick Libby, American Air
tung, representative of the postoffice at Belmont Park; Augustus Post, Secretary
ernors, Aero Club of America, Editor and Publisher of AERIAL AGE; Mr. Huff,
ndard Aircraft Corporation; Mr. Alan R. Hawley, President Aero Club of Amer-
Praeger, second assistant postmaster general; Captain Benjamin B. Lipsner,
sing agent U. S. Postoffice; "Rusty" Bounds, chief pilot, Standard Aircraft Cor-
ostmaster, Elizabeth; Mr. John F. Sinnott, postmaster, Newark, N. J.; and their
ris, superintendent of mail of New York City; Mr. G. L. Connor, chief clerk of
Mingle; Mr. Evan J. David, managing editor of FLYING**



Mr. Mingle handing to Postmaster Praeger and Captain Lipsner the first mail to be sent on the newly acquired postal aeroplanes



**eplanes equipped with Liberty motors. On July 31 the Dayton-Wright Co. completed the 1,000th battleplane of this type and the
e battleplanes were made by the Dayton Metal Products Company**

FOREIGN NEWS

FRANCE

The French War Office on Aug. 2 issued the following statement:

On the 31st seven German aeroplanes were downed during the day. Twenty-two tons of explosives were dropped on aviation grounds between the Aisne and the Vesle and on barracks and encampments of the enemy in the valleys of the Ardre and Vesle.

The official statement of Aug. 8 contained the following:

During the month of July 184 enemy aeroplanes were drowned. One hundred and fifty-four enemy aeroplanes were seen falling out of control inside the enemy lines, of which number fifteen had been damaged by the fire of our aircraft guns. Thus 338 enemy machines were destroyed or badly damaged.

In addition our aeroplanes set on fire forty-nine enemy captive balloons.

During the same month our bombarding squadrons during the daytime dropped 194 tons of explosives and in the night time more than 356 tons, thus making a total of 550 tons dropped on bridges in the Marne Valley, on enemy troops that had advanced south of the Aisne, and on railroad stations in the region of Laon, Hirson and Rethel.

The French official for August 9th says:

"The French aviators have been a valuable auxiliary in the battle to the south and east of Amiens. In spite of a thick mist and low clouds, which increased the difficulty of their work, our squadrons made numerous reconnaissances above the enemy lines, taking part often in the fight with their machine guns. During the battle they captured four enemy aeroplanes. Four captive balloons were shot down. Finally our bombing machines dropped nearly ten tons of bombs during the night on railroad stations in the neighborhood of Chaulnes, Nesles, and Roye. Fires and explosions were observed, particularly in Roye and Nesles."

GREAT BRITAIN

An Admiralty statement on aerial acitivities, issued Aug. 2, says:

"Detailed reports have been received from Royal Air Force units, working with the navy in the Mediterranean, Adriatic and the Aegean. Anti-submarine and escort patrols have been well maintained in the Mediterranean and Adriatic.

"As indicated in recent Italian official communiques from Rome, our Adriatic formations have closely co-operated with the Italian air forces in raids on the Austrian naval ports of Cattaro and Durazzo, and in the land operations at Valona (Avlona).

"In the Aegean a constant reconnaissance of the Dardanelles has been maintained. In two raids on Kule Burgas, on the Oriental Railway, direct hits were obtained on the railway station, which was much damaged.

"A raid on the Karagachi Station and the bridge which carries the Oriental Railway across the Arda resulted in direct hits on the line, close to the bridge, and among rolling stock. A raid on the railway station and bridge at Uzenkopri resulted in damage to the station buildings.

"During a dawn reconnaissance of the enemy coast north and west of Imbros thirteen casques were observed. Bombs were dropped, damaging two and destroying a third. A new enemy aerodrome at Uzenkopri was bombed and photographs show much damage was done, one hangar being completely destroyed.

"A raid was made at dawn on July 26 on Nagara, and at night on Galata. A further raid on these two places was made during the night of July 28. Over half a ton of bombs were dropped and large fires were started. One of our machines failed to return.

"The basin and dockyard at Constantinople was successfully bombed just after midnight on July 27, but full details have not yet been received.

"In home waters during the period July 25-31, anti-submarine, hostile aircraft and escort patrols have been maintained. Submarines have attacked with success.

"More than fifteen tons of bombs have been dropped on objects of military importance at Zeebrugge, the Bruges docks and Ostend. Enemy shipping has also been bombed, and a direct hit with a 230-pound bomb was obtained on the stern of the leader of four enemy torpedo boat destroyers. Columns of smoke were seen to arise, but the mist obscured further observation.

"Our bombing patrol and escort formations have been attacked by enemy aircraft. Fifteen enemy machines have been destroyed and twelve shot down out of control. Five of our machines have failed to return, one of which is known to have landed in Holland. One of our seaplanes on patrol was shot down in flames. Two of the crew were drowned."

A weekly review of the air fighting shows that in the week seventy enemy machines were destroyed on the western front and eleven driven down out of control, while only twenty-seven British machines were reported missing. On the other fronts eighteen enemy machines were destroyed at a cost of two British planes.

In the course of the week there were seventeen raids into Germany, in which Offenburg was bombed three times and Stuttgart, Saarbruecken and Baden twice each. There were also eighteen raids on German naval and military bases in Belgium, in which Ostend was bombed four times, the Bruges docks thrice and Zeebrugge twice.

Major Edward Mannock, one of England's most successful flying men, who had fifty-eight German machines to his credit up to a month ago, is missing. He was last seen fighting over the German lines July 20, when his machine was observed to fall in flames.

A dispatch from Geneva reports that the British aerial attacks on the Stuttgart and Coblenz Railway Stations on Aug. 2 were the most terrible experienced during the war. Many tons of bombs were dropped, large portions of the stations were destroyed and serious interruptions to railway traffic was occasioned.

No trains from these two towns are arriving at Basle, but the Germans say this is because the railway is monopolized for military purposes. It is known, however, that the Royal Palace at Stuttgart was damaged, while at Coblenz a newly built ammunition factory was partially destroyed.

All travelers arriving in Switzerland from across the frontier declare that the terror of these successive raids is inceasing in the Rhine towns and that from Istein, near Basle, the exodus of population continues into the interior.

The text of the official statement relative to the air raid on Aug. 5th, follows:

"Five enemy airships attempted to cross the coast last night, but while still at sea were attacked by Royal Air Force contingents, co-operating with naval units.

"Three were engaged in action and one was shot down in flames forty miles from the coast. Another was damaged, but probably succeeded in reaching its base."

The novel feature of the raid was the early arrival of the airships. Two of them were actually seen approaching the coast by holiday makers from the promenade of a widely known seaside resort. It is considered possible that the Germans miscalculated the visibility, and by arriving before dark invited an easy defeat.

Aeroplanes immediately went in pursuit, and the Zeppelins, throwing out smoke clouds, turned northward and endeavored to escape. They were overtaken some forty miles from the shore and just before midnight one was brought down in flames and another damaged.

The following official communication on aerial operations was issued on Aug. 7:

Four German machines were shot down during the day of August 6 and one was brought down in flames in the following night. During the twenty-four hours, twenty-four tons of bombs were dropped by us on railways, aerodromes and billets of the enemy and several direct hits were observed. All our machines returned safely.

The statement for Aug. 8 reads:

On Aug. 7 observation was rendered difficult by grounded mist. However, a considerable amount of reconnaissance and photography was carried out. Over seventeen tons of bombs were dropped during the with good effect, and a large number of combats took place. Fifteen hostile machines were brought down, and seven driven down out of control. Two of our machines are missing.

A ton of bombs were dropped during the night, when operations were hampered by bad weather. One of our night flying machines is missing.

The following official communication was issued on Aug. 8 by the Air Ministry:

"On the morning of the 8th our machines carried out a successful attack on the explosives factories at Rombach, in Alsace-Lorraine, ten miles northwest of Metz. Good results were obtained. All our machines returned."

According to the latest report of the Royal Air Force, the British four years ago possessed less than 100 aeroplanes. Now the Royal Air Force destroys in a week on an average a larger number of hostile aeroplanes than that.

The number of German aircraft destroyed in June by the British alone reached 314, and 168 others were driven down out of control. Against that total of hostile machines destroyed, 168 British machines were reported missing.

In another month 518 German aircraft were accounted for and only 128 British machines were missing. During one month British airmen fired 915,308 rounds of machine-gun ammunition at ground targets, dropped 853 tons of bombs over different military objectives, and made four bombing raids over Germany, apart from the work over the battle area of engaging nearly 2,000 hostile batteries.

In a single month the Royal Air Force has taken more than 40,000 photographs over hostile lines. During the year ended July 30, British airmen accounted for considerably over 4,000 hostile aircraft. The number of British machines reported missing for the same period was just over 1,000.

Apart from new production, the Royal Air Force constructs more machines in one month than Britain possessed altogether at one stage of the war, while the personnel has been multiplied more than 200 times.

It is no uncommon thing for British airmen to bomb military objectives in Germany three times in one day.

At one repair park for air-force motor-transport in the battle zone in France to-day 1,000 hands are working day and night, and motor transport is but one of the minor factors, for this many-sided industry embraces almost every known trade and handcraft.

GERMANY

Berlin—The following statement on today's battle developments was issued Aug. 2 by German great headquarters:

Yesterday we shot down fourteen enemy aeroplanes. Our bombing machines were very active during the night and destroyed, among other things, a big French ammunition depot north of Chalons.

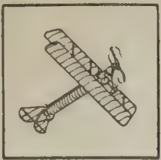
An official communication from Berlin says:

On the night of the 5-6th one of our airship squadrons, commanded by Captain Strasser, who so often has successfully led our airship attacks, again wrought heavy damage on the east coast of England by effective bombing attacks, particularly on Boston and Norwich and the fortifications at the mouth of the Humber.

With his brave crew, Captain Strasser probably met with a heroic death. All the other airships participating in the attack have returned without losses or damage, despite strong resistance.

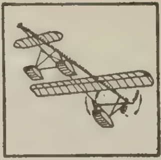
The German official for August 9th said:

"We shot down over the battlefield thirty aeroplanes."



MODEL NEWS

Edited by John F. McMahon



CLUBS

THE AERO SCIENCE CLUB OF AMERICA
90th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon. Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington. Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore. Md.

TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas

SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

Model Aeroplane Building as a Step to Aeronautical Engineering

The accompanying drawing shows clearly the construction and method of fastening or rigging the main planes.

The planes are built up of wood, reed and thin strips of bamboo. The main spars are made from strips of ¼ x ⅛-inch spruce, the edging is ⅛-inch round reed and the ribs are made of two strips of bamboo laid one over the other to form a double surface rib.

To construct the main plane lay the two main spars the distance apart as given in the drawing and fasten the bottom part of the ribs in place, with thread and glue. The bamboo strips should be as thin as possible to save weight, because being of double surfaced construction it would be an easy matter to construct the wings, too heavy to fly, if the ribs were cut thick.

When the bottom parts of the ribs are fastened in place bend to the shape shown in the cross section at the left hand bottom of the drawing.

Next fasten the reed edging in place laying it on the top of the rib pieces at the ends. The tips of the wings should be bent to a convenient and attractive curve, and the main spars should be tapered from ¼″ to ⅛″ at the ends and the reed fastened to them.

It will be noticed that a space is left out of the wing plan in the drawing to show the shape and size of the ailerons. It is optional whether the wing is made with the ailerons cut out and movable or the wing is made solid, that is having no ailerons, I would prefer the former as the model would then be able to perform different stunts in the air by moving the ailerons up or down, etc.

Should the model builder prefer to make the wing with ailerons he should cut off the two end ribs on each side of the plane at the rear main spar as shown at the right side of the plan.

The aileron is then made to conform to the shape of the trailing edge of the plane.

When the bottom parts of the ribs are fastened in place and bent to the desired curve, the top part of the ribs should be cut and bent to the proper curve. Notice that the bottom rib strips lie under and are fastened to the reed but the top strips do no lay over the reed but butts against the reed and the ends are fastened to the under strips just a fraction of an inch before meeting the reed edging.

The bottom plane is constructed in the same way, but the model builder should be careful to construct one right and one left side. There are no ailerons in the bottom wings the ends have a large curve at the trailing edge.

The method of construction is shown at the right hand top of the drawing and is clear enough to show the method of spacing and fastening the ribs, spars and reed.

The Curtiss machines have a center panel over the fuselage the wings being made into two pieces and fastened to this section, but for ease of construction I have made the plane in one piece and I think the model builder will find it better when fastening to the model.

The covering is next put on. Silk or paper can be used, but the former will give the best all around service and make the neatest job.

To fasten the covering to the planes use hot glue. This is made in a small glue pot which may be purchased at almost any hardware store. The glue is boiled in water until it reaches the consistency of paint. Apply a little to the edging and place the silk in place holding it until glue sets. The silk should be fastened at the ends first and stretched as tightly as possible. When set it is an easy matter to fasten along the entering edge and then along the rear edge taking care to pull up tight so no wrinkles appear.

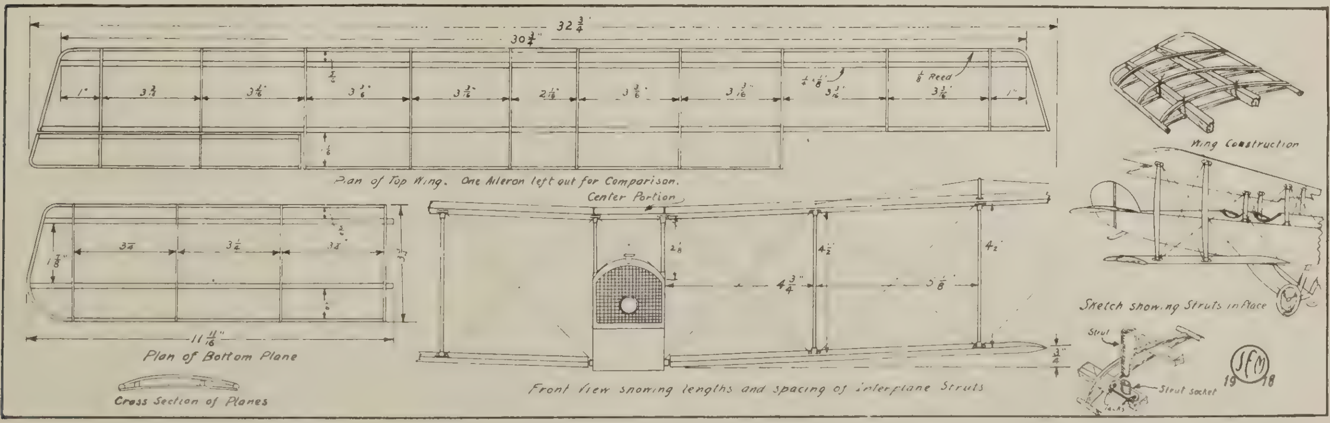
When covering the wings the bottom side of the top planes and the top of the bottom planes should be put in place first as it is then an easy matter of fastening the strut sockets in place, after which the other sides may be covered.

The struts are made of spruce ¼″ x ⅛″ and made to a streamline shape the bottoms being rounded to ⅛″ to fit into the ⅛″ strut socket which can be purchased at a model supply house. The lengths and spacing of the struts can be had from the front view at the bottom of the drawing. It will be noticed that the wings have a slight dihedral angle. The angle is shown by the broken line under the right bottom wing.

A sketch of the rigging of an aeroplane is shown at the right.

The fuselage of the model made also to be covered with silk.

(To be continued)

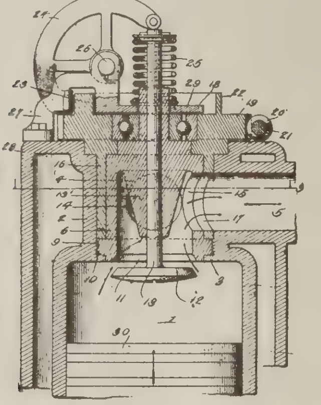


RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,259,728. ENGINE VALVE MECHANISM. SAMUEL FRANK EASTMAN, Petersburg, Ill. Filed Mar. 12, 1917. Serial No. 154,322. (Cl. 123—79.).

In an engine valve mechanism, the combination of a cylinder having an intake and exhaust located in approximately the same plane, a passage member fitting into the outer end of the cylinder and having ports for communication with said intake and exhaust, a sleeve valve controlling communication between said ports and said intake and exhaust, means for rotating said sleeve valve, a second valve for controlling communication between said passage member to the cylinder, said second valve having an operating seam exploding through said passage member and the exterior thereof, and means for operating said stem including a cam rotatable bodily with said sleeve valve.

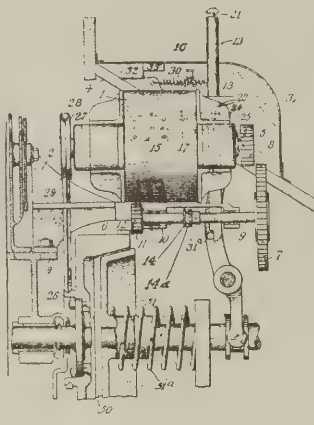


In the engine valve mechanism, the combination of a cylinder having an intake and exhaust in substantially the same transverse plane, a passage member fitting into the outer end of said cylinder and having ports opposite said intake and exhaust, a rotary sleeve valve surrounding said passage member and having a port for alternate registration with the aforesaid ports, a gear carried by the outer end of said sleeve valve and means for rotating said gear, an annular flange carried by the outer side of said gear and concentric therewith, said flange having a cam, a valve for controlling communication between the inner end of the passage member and the cylinder, said valve having a stem extending through said passage member to the exterior thereof, and a rocker arm operated from the aforesaid cam for controlling said stem.

In an engine valve mechanism, the combination of, a cylinder having an intake and exhaust in substantially the same plane, a passage member fitting into the outer end of said cylinder and having ports disposed opposite said intake and exhaust, a rotary valve sleeve surrounding said passage member and having a port for alternate registration with the aforesaid ports, means for rotating said sleeve valve, a cam rotatably bodily with said valve, a rocker arm controlled by said cam, a second valve controlling communication between the passage member and the interior of the cylinder and having a stem extending through said member to the exterior thereof, said stem engaging said rocker arm, a spring surrounding the outer end of said stem for normally closing the valve thereof, a bracket upon which said rocker arm is mounted, and an extension on said bracket serving as an abutment for said spring.

1,259,744. ENGINE-STARTING SYSTEM. JOHN H. HUNT, Dayton, Ohio, assignor to The Dayton Engineering Laboratories Company, a Corporation of Ohio. Filed July 3, 1914. Serial No. 848,902. (Cl. 172—239.)

In an engine starting device, the combination with an engine and a starting device therefor; of a controlling member for said starting device; a lever associated with said controlling member; means normally engaging said lever to latch the controlling member in normal position; and means operaable by said lever when operated to unlatch the controlling member to effect an initial operation of the starting device.



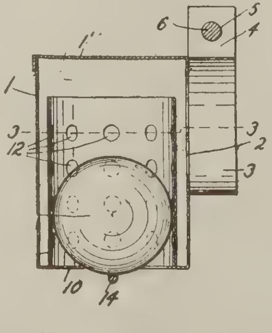
In an engine starting system, the combination with an engine, and a starting device therefor; shiftable elements for connecting the starting device and engine together for starting purposes; a control lever for shifting said shiftable elements; means for imparting an initial operation to the starting device to facilitate the shifting of said elements; and means for locking the said control lever in inoperative position, except when the means for imparting the initial movement of the starting device is operated.

In an engine starting device, the combination with an engine, including a clutch controlling member; of a starting device for said engine, including an electric motor having circuit connections; means for coupling the electric motor and engine together for starting purposes; and a starting lever normally locked in inoperative position by means of the clutch controlling member, said starting lever being operable to make the motor circuit connections and to shift the means for connecting up the engine and motor together, when the clutch controlling element has been shifted into position to throw out the engine clutch.

In a starting system for engines, the combination with an engine, including an electric member; of a starting device, including an electirc motor having circuit connections; switches for making and breaking said motor circuits; latching means for preventing the operation of one of said switches previous to the operation of another of said switches; and a mechanical interlock associated with the clutch controlling member for preventing the operation of one of said switches until the clutch controlling member has been actuated to throw out the engine clutch.

1,259,858. GAS-SAVER FOR INTERNAL-COMBUSTION ENGINES. JOHN L. HAGUE, Los Angeles, and WILLIAM A. BRADLEY, Tropico, Cal.; said Hague assignor to said Bradley. Filed Sept. 16, 1916. Serial No. 120,528. (Cl. 137—32.)

In combination with a carbureter for an internal combustion engine, an air inlet device connected to admit air to the inlet of the carbureter and comprising a vertical tubular member open at its lower end to the outer air and provided with lateral aperture means communicating with the interior of the carbureter, and a valve member slidable in said tubular member to close more or less of said lateral aperture means, so as to provide for substantially constant drop of pressure at the valve at different speeds and stop means for preventing complete closure of said lateral aperture means by said valve member.



(*Continued from page* 1112)

Home for Italian Aviators

Hon. Guiseppe Bevione, head of the Italian aviation mission in this country, has leased the home of Mr. Lee Stubblefield, at 2356 Massachusetts Avenue, Washington, D. C., for the duration of the war. He will have with him there some of the Italian officers and other members of the mission associated with him.

Canadian Aviator Receives New Honors

Montreal, Aug. 5.—Maj. William Bishop, the Canadian aviator whose active fighting career was recently interrupted by his appointment to the British Air Board, has been awarded the distinguished flying cross in recognition of his destruction of 72 German aeroplanes. He destroyed 25 German machines in 12 days, five of which he brought down on the last day of his active service.

Already possessing the Victoria Cross, the D.S.O. with a bar, and the Military Cross for attacking single handed a German aerodrome and destroying forty-seven enemy aircraft, Major Bishop's latest honor was characterized in orders as "given to the most successful and most fearless fighter in the air," whose "value as a moral factor to the air force cannot be overestimated."

Aeroplane Mail Service Between Air Schools

Austin, Tex.—An aeroplane mail service has been established between Kelly Field at San Antonio and the Government School of Military Aeronautics at Austin.

The air line distance between the two terminals is about seventy miles. There is a considerable amount of official communication between the officers of the two training camps and some of it is of such a pressing nature that it was found necessary to adopt the use of the aeroplane for carrying the letters instead of depending upon the slow movement of the mails by train. The mail by aeroplane is delivered in a little more than an hour from one terminal to the other, which is about as good time as is had by ordinary telegraph service.

It was at the school of military aeronautics here that most of the Kelly Field students received their ground training. They come over to Austin in flocks of as many as fifteen in one formation each day and it is customary for them to make an aerial visit to the institution where they received their twelve weeks' course of ground training and to do all kinds of daring stunts above that school for the edification of the prospective flyers who are there at the time.

Army Aviator Fly Caproni Plane

For the first time since their construction, an Italian Caproni biplane of American make with a Liberty motor installed, was flown by four American Army aviators on July 13 at Mineola, L. I. The test was witnessed by all the Italian officers at the field and was by permission of Major C. K. Rhinehart, S.C., U.S.A., commanding officer. Lieutenant E. L. Williams, C. B. McCullough, E. O. Barr and A. T. Watson, A.S., S.C., took the machine for a preliminary run, then it flew a half hour with the four American pilots alternating in driving. They handled the machine perfectly. When the engine was shut off the big plane landed as easily as one of the lighter type Curtiss machines. The Liberty motor did all and more than was asked of it.

Our Air Schools "Over There"

The New York "Times" special correspondent, in conclusion of the first authorized description of the work accomplished by the American forces since they landed in France, writes of visits he paid to several of the new American flying schools. He says:

"I am convinced that these American boys will rank among the best fliers in combat work at the front. On a recent Sunday morning at one of the flying centers I visited there were perhasp sixty machines in the air at once, some practising in formations, some doing ordinary stunts, some advanced acrobatics, and others hard at combat work.

"At another point some distance away I was equally impressed with both the work in progress and the working plans of one of the extensive so-called 'air service production departments.' This important center of activity, which is typical of several now in course of construction, covers a tract of land over six miles long by a mile and a half wide, where the construction, testing, and repair of American aeroplanes will soon be going ahead full tilt on a scale never before known. The work splits into four main divisions—transportation, production, construction, and supply."

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Colum bus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points mentioned in order named for temporary duty.

Note 2—Report to Army Balloon School, Lee Hall, Va.

Note 3—Report to Mechanics Training School, St. Paul, Minn.

Note 4—Report to Aviation General Supply Depot, Philadelphia, Pa.

Note 5—Report to Goodyear Tire and Rubber Co., Akron, Ohio, and wire DAP.

Note 6—Report to Curtiss Aeroplane Co., Buffalo, N. Y., and wire DAP.

Note 7—Report to 312 the Squadron, Bolling Field, Anascostia, D. C.

Special Orders Nos. 70 to 73, Inclusive

A

Anderson, Richard M.	FRF
Aleshouckas, Joseph W	SLR; TFT
Andrews, Frank M.	KST
Adams, Stanley B.	PWM
Aehle, Truman Homer	SLA; CRI
Adams, Frank D.	DIK
Acton, Gene W.	DIK
Abernathy, Claude W.	PWM
Ammel, Roy W.	FRF

B

Beehler, Charles H.	DIK
Bromley, Thomas Roden	SLA; CAF
Butterfield, Harold H.	FRF
Baker, Kenneth C.	SLR; CAF
Baskey, Earl F.	SLR; CAF
Byron, William D.	SLR; CAF
Becker, Albert Francis	SLA; WFO
Bush, Lyle K.	SLA; WFO
Byrns, Benjamin M.	SLA; WFO
Boyd, Linn	SLA; WFO
Buntin, Robert Bobson	SLA; WFO
Brinker, Tom Joseph	SLA; RSD
Brokmeyer, Albert F.	FRF
Blood, Harold E.	FRF
Bates, Hervey	SLA; BFT
Bailey, William N.	EOT
Barrett, Arthur Ernest	SLA; KST
Bell, Ned C.	WFO
Brown, Reed Bracken	SLA; SBI
Brissell, Willard S.	TFT
Barrett, William J.	SLR; TFT
Baker, Joseph B.	FRF
Bardon, Paul E.	SLR; CAF
Bleakley, Wayne W.	CAP
Beardsley, Charles B., Jr.	SLR; CAF
Bermant, Lester C.	FRF
Brown, David K.	SLR; TFT
Borden, Joseph L.	FRF
Boyd, Wilfred Roswell	SLA; BFT
Burdick, Lorence B.	PWM
Barrett, Vinton E.	PWM
Beehler, George H.	PWM
Bisgood, Frederick W.	PWM
Bockus, Harry N.	PWM
Brown, Harold L.	PWM
Buchanan, James P.	PWM
Burns, George R.	PWM
Buchanan, James B.	SLR; SRC
Batt, Joseph S	CJW
Black, Walter Lorraine	SLA; HHN
Boggs, William G.	BST
Brooks, Charles Henry, Jr.	SLA; CAF
Baird, John L.	SMM
Bryan, Edward D.	SLA; WFO
Brown, Clifford A.	FRF
Bryant, Fred L.	SLA; BST
Beisel, Harold N.	DIK
Buswell, Walter Scott	SLA; PMT
Burns, Le Roy W.	FRF

C

Cobe, Harry H.	FLR
Camp, Victor F.	FLR
Cutlin, Robert Willard	SLA; LHV
Carey, Allan James	SLA; SBI
Caulfield, Sydney W.	FLR
Cromelin, Paul B.	FLR
Crofoot, Edward Brooks	SLA; FOB
Cameron, David	FRF
Casey, Mathew Arthur	SLA; CFT
Carney, Norfleet Lynn	SLA; CWT
Connelley, Robert M.	DIK
Crocker, Clarke Wilkins	SLA; RSD
Clark, McKinley F.	SLR; TFT
Cleveland, Chester E	CWT
Carter, Charles F.	SLR; CAF
Camblin, Roy W	PWM
Clark, Willard S.	PWM
Colton, Earl G.	PWM
Conlogue, John A.	PWM
Cooper, Edwin J.	PWM
Cummings, Charles M.	PWM
Christopherson, Fred C. Q.	DIK
Caspary, Delo Harvey	SLA; CWT
Crowell, Robbins Pentecost	SLA; PMT
Caffery, James Parkerson	CPA; DAP
Curtis, Tooth S.	SLA; RSD
Cecil, Eugene	SLA; KST
Clarke, William B.	DIK
Cheak, Chester W.	FRF
Connelly, Robert Michael	SLA; CAF

Christensen, Ezra Allen ....SLA; CRI
Clairborne, Harry C.........................DIK
Corkille, John D.............................DIK
Cogan, James E..............................KST

D

Dunkin, Russell VanCleave.........SLA; HHN
Down, Ralph ....ALF
Delaplane, Edwin Sease, Jr..........SLA; SBI
Dahlem, Earle Clifford..............SLA; KST
Druffner, Karl Martin...............SLA; PMT
Duthie, Robert Douglas.............SLA; SBI
Day, Curtiss LaQ............................FRF
Durfee, Charles Pierce..............SLA; SBI
Dalton, William Edward............SLA; TFT
Denny, Cary F...............................PWM
Denbo, George W............................CWT
De Wald, William N..........................DIK
Dillon, Lynn Gilbert.................SLA; CRI
Dunlap, Daniel David...............SLA; CRI
Deadman, William W........................DIK
Davis, Claud A.................................DIK
Delaplane, Edwin S., Jr....................BST

E

Estep, Edwin R................................SRC
Eskind, Ernest.................................DAP
Eastman, Andrew James............SLA; KST
Ervin, Robert G................................FRF
Evons, Leonard Reese...............SLA; ELA
Edrington, John Price..............SLA;CAF
Espey, John E..................................FLA
Ebright, Carroll M............................CWT
Elston, Welsome B............................FRF
Engstrom, Theodore Albert..........SLA; RSD
Eby, Samuel Hilary..................SLA; CFT

F

Fagan, Edward T...............................ALF
Foard, John Whitby Jefferson.......SLR; ALF
Fitzpatrick, William S......................FRF
Fiester, Ritner I......................SLA; WFO
Fuller, Edward R.............................PWM
Frisbie, Hallet B.............................PWM
Frederick, Karl A.............................FRF
Fleming, Carl Sumner...............SLA; PMT
Falcon, Guilford W...........................FRF
Filson, Harry Raymond.............SLA; RSD
Fay, George H.................................PWM
Faust, Leroy H................................PWM
Fields, Frank E...............................PWM
Finn, Matthew E..............................PWM
Fry, John O....................................PWM

G

Goldsborough, Paul...........................CAF
Goetz, Alvin C..................................FLR
Gore, William Martin..............SLA; LDT
Gaffney, Dale Vincent........SLR; FRF; PMT
Graham, Leland J..............................CAF
Gale, Harold D................................PWM
Gay, Ernest H..................................PWM
Giles, Barney M....................SLR; TFT
Gordon, Harold R..................SLR; CAF
Gallup, Burton A.............................PWM
Garoni, Rudolph...............................PWM
Goode, Henry W...............................PWM
Gooding, Carlos C. V.........................PWM
Goree, Roger C................................PWM
Gray, Ralph C..................................PWM
Grout, Lewis William...............CPA; DAP
Grant, Charles Hampson...........SLA; KST
Garrigan, Louis George............SLA; GLC
Glennon, Herbert L............................DIK
Glanz, Carl C...................................PWM
Graham, Arthur S.............................PWM

H

Howad, Doctor Marmaduke.........SLA; LDT
Henderson, James Max.............SLA; TFT
Hawkins, Ivan..................................FRF
Herron, Robert McKisson...........SLA; LDT
Harvey, Raymond....................SLA; TFT
Hungerford, Carleton Couch...............CPR
Harper, Maitland C............................FRF
Hill, Lon C., Jr.................................FRF
Halsey, Wilmot Benjamin..........SLA; PMT
Hallam, Harry..................................PWM
Hajek, William J..............................PWM
Hays, William W...............................PWM
Holland, James C..............................FLR
Henderson, William A.........................FRF
Hardy, Richard L..............................PWM
Hughes, Herbert...............................MJR
Hillman, Charles A............................FRF
Hodason, Harold C.............................DIK
Hillix, Albert F.................................FRF
Hadeen, Edward A...........................Note 3
Henderson, Denny Edwin...........SLA; CRI
Hoover, Chester A.............................DIK
Hilton, William T., Jr..........................CAF
Haddorff, Carl L...............................PWM
Headley, Mervin E............................PWM
Heaney, Francis C.............................PWM
Hughes, Edwin D..............................PWM
Hueffner, Frederick W.........................DIK
Hickman, James B.............................DIK
Hubbard, Lyle...................................DIK
Haggerty, Stewart A...........................DIK

J

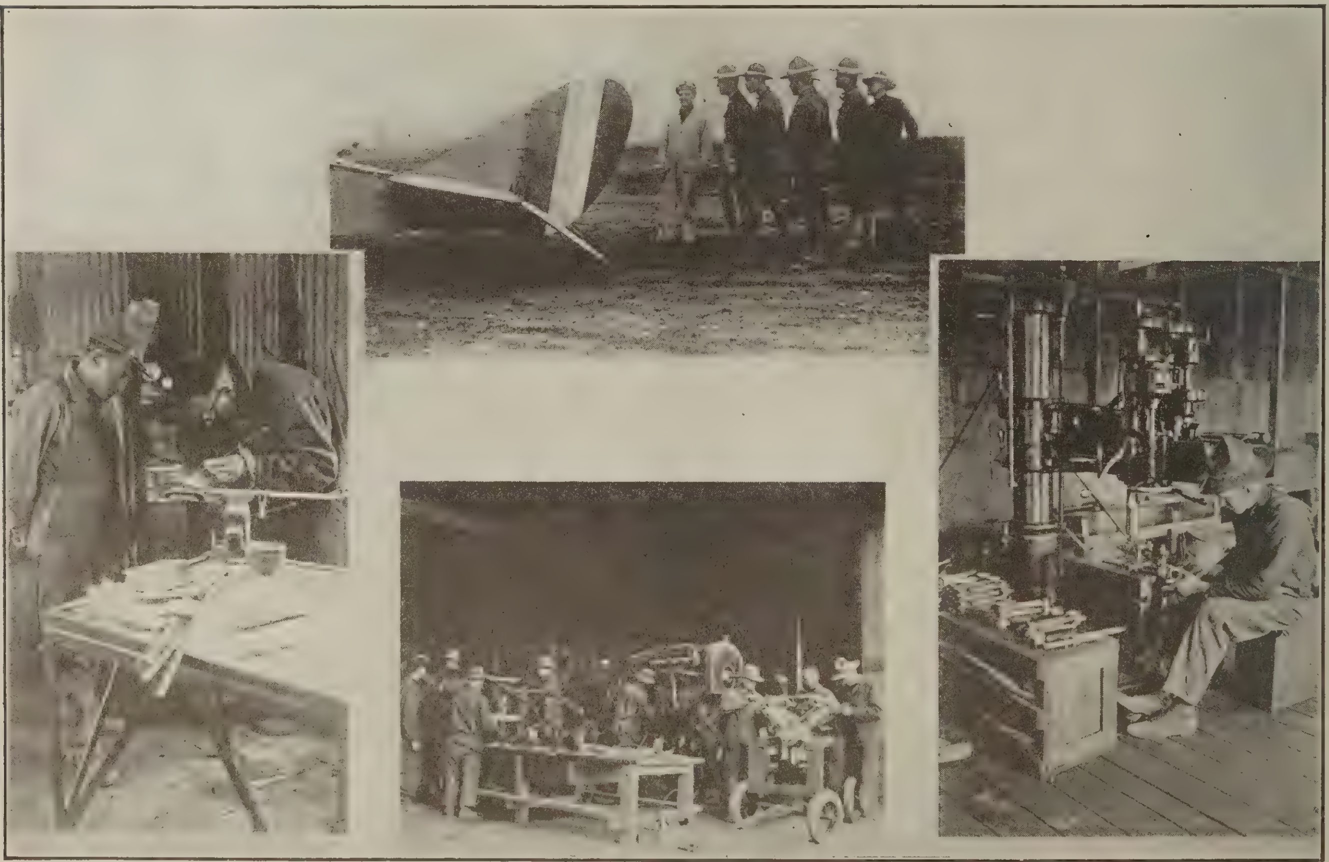
Johnson, Sydney Kent...............SLA; PFO
Joyes, Morton Venable.......................CPR
Jackson, Oliver P..............................FRF
Jeffries, John M.......................SLR; CAF
Jones, Jay S............................SLR; CAF
Johnston, Neil S...............................FRF

K

Kent, Everett Frank...............SLA.; CWT
Kauffman, Carl R..............................PFO
Kirkendall, Freeman B........................MAT
Kennedy, Robert Joseph............FLA; DAP
Kuehl, Adolph Alexander...........SLA; BFT
Kendall, Harry Adelbert.............SLA; GLC
Kirby, Maxwell.................................DMA
Krigger, Augustus H...........................FRF
Kintzing, Edward Oliver.............SLA; TFT
Kennedy, James Alexander, Jr......SLA; TFT
Kyle, William F................................PWM
Kilbane, James A..............................PWM
Kievlan, Charles E.............................FRF
Kimball, Dan A........................SLR; CAF
Keller, Clarence K....................SLR; TFT
Kritzer, Henry E...............................DIK
Keenan, Lorenzo Joseph...........SLA; KST
Kenney, Cornelius J..........................PWM
Kier, Samuel M................................PWM
Kirby, Samuel B., Jr..........................PWM
Kloke, Carl P...................................PWM
Kipp, Eugene H.................................DIK

L

Long, Howard Vassar...............SLA; SBI
Lovejoy, Kenneth Frick..............SLA; TFT
Lanagan, William Michael..........SLA; PFO
Long, Leonard F...............................MAT
Lamb, Howard E...............................EOT
Langmead, Harry Willard..........SLA; CWT
Littlejohn, Harry F............................CPR
Lea, Royal B....................................FRF
Langley, John A.......................SLR; CAF
Lockwood, Lyman B...........................FRF
Lemley, Russell W.............................FRF
Lewis, Mason A................................CPR
Longstreet, Jack Y.............................FRF
Lankey, Francis I..............................PWM
Lawnin, Nelson.................................PWM
Lawton, Merritt L..............................PWM
LeVitt, Morse D................................PWM
Lewis, Harold M................................PWM



Previous to his first trip in the air in a dual control plane, each flying cadet inspects his plane, just as he does later on when he gets his own machine. In squads of six, the cadets accompany their instructor who goes over the plane explaining the operation of the controls and engine. Then he takes them up one at a time

While they are not flying the cadets watch their companions at arms, and endeavor to learn from their mistakes just what not to do. All the student aviators are instructed in the care and repair of their "ships", working at different times in the shops. A lesson in brazing and welding is being given in the left-hand picture, and a man is operating a drill in the machine shop on the left.

Engines receive close attention lest they go wrong and fail thereby endangering the life of the cadet. If they cannot be adjusted properly they have to be taken out of the machine and sent to the shop for overhauling. But in a short time a new engine is installed in the plane and away it goes.

Lile, Richard L.	PWM
Locher, Edward O.	PWM
Loder, James A.	PWM
Logan, William L.	PWM
Lewis, James C.	Note 2
Landan, Charles H.	BFT
Leisure, George S.	DIK

M

Martins, Algernon F.	SLR; CGC
Mitchell, Kenneth D.	SLR; CGC
Matthews, James C.	FRF
Miller, Edward F.	FRF
Mitchell, Eliot W.	FRF
Moore, John S.	FRF
Morgan, Edward Frederick	SLA; SBI
Maxwell, Robert R.	FRF
Merritt, Edward K.	FRF
Morner, Edward C.	FRF
Molleson, Gilbert C.	TMA
Mitchell, Clark G.	FLR
Miller, Max B.	DIK
Macks, Robert G.	DIK
Morrisy, James E.	CWT
Madden, John H.	PFO
Martin, Douglas Edison	SLA; DAP
Mitchell, Philip C.	CAF
Marshall, Howard P.	PWM
Matthews, David R.	PWM.
Miller, Harry B.	PWM
Morrissey, Raymond A.	PWM
Mercer, Robert A.	SLA; DAF
Murray, John Gaines	SLA; CRI
Mahoney, Vincent Daniel	SLA; VBW

Mc

MacKenzie, William J.	SLR; TFT
McMullen, Alexis B.	CWT
McMahan, John	SLA; HHN
McDonnell, John C.	DMA
McMichael, Lawrence D.	SLR; CGC
McGeary, John Elliot	SLA; SBI
MacClellan, George H.	FLR
McGinty, Daniel Joseph	SLA; CRI
McMackin, Albert F.	SLR; CGC
McClymond, Ernest L.	SLR; CGC
MacHardy, Alexander Charles	SLA; SBI
McFarland, John J.	CRI
McArthur, John Knox	SLA; TFT
McIntosh, Lawrence W.	WFO
McKeever, James Lawrence	SLA; DAF

N

Norris, George L.	MJR
Nelson, Erik H.	FRF

O

Oaks, Harry Charles	SLA; PMT
Ong, David G.	CPR
Organd, John D.	FRF
Overmire, Wilfred J.	FRF
Oliphant, Rufus A.	SLR; TFT
Oliver, Walter L.	CWT
Officer, Herbert G.	DMA
O'Leary, Arthur C.	FOB

P

Patton, William D.	SLR; CGC
Pritchartt, Alexander V.	SLR; CGC
Piper, Raymond Alden	SLA; PMT
Pinckney, Jerald J.	SLR; TFT
Polkinhorn, William O.	SLA; DAP
Phillips, Charles A.	SLA; GLC
Pierce, Harold	ALF
Pearson, Laurence H.	SLA; GLC
Pugh, Harvey Meredith	SLA; RSD
Pfeil, Paul Francis	SLA; GLC
Powers, Perry Montgomery	SLA; SMM
Pinkham, Henry Palmer	SLA; CRI
Price, Albert Chanoweth	SLA; WFO
Payne, Franklin Storey	SLA; KST
Palmer, Charles Harlan	CRI
Pierson, Ellis Headley	SLA; CWT
Peterson, Lloyd Julius	SLA; SMM
Powderly, Daniel William	SLA; CRI
Pavey, Smith Wendell	SLA; GLC

Uncle Sam's embryonic aviators being inoculated against typhoid fever and vaccinated against smallpox. This precaution is taken to protect the men's health almost as soon as they enter the service. Three inoculations are necessary. They are administered at intervals of about ten days. The immunity lasts about two years. The above photograph was taken at one of the aviation camps in the United States

Powers, Edward Michael	SLA; KST
Phelps, Edward G.	DIK
Peterson, Frank L.	DIK

R

Reyerson, Wallace Eugene	SLA; CRI
Ritchey, Silvester Douglas	SLA; EOT
Russell, Howard Fraser	SLA; DAF
Rollins, Joseph R.	APR
Rasmussen, Harry	SLA; FOB
Reynolds, George H.	PWM
Redin, Roy W.	PWM
Robertson, Archie M.	PWM
Randall, Rex Roland	SLA; RSD
Roehl, John F.	CGC
Robertson, Charles B.	FRF
Reinberg, George E. A.	DMA
Richards, John Preston	SLA; PMT
Runkle, Charles Grossman	SLA; CRI
Reily, Henry Harold	SLA; KST
Roche, Walter	SLA; CWT
Rust, Franklin M.	FRF
Rausch, Lorenzo August	SLA; TFT
Ramseur, Benjamin F.	CWT
Rowe, Hiram H.	FRF
Russell, Edward Clarendon	SLA; Note 5
Ruckstell, Grover Edwin	CPA
Reamer, Thomas Murray	SLA; WFO
Rundlett, Nelson Smith	SLA; EOT
Rust, Franklin M.	EOT
Robbins, Ralph B.	PWM
Rogers, Henry S.	PWM
Romans, Edgar D.	PWM
Ronan, John A.	PWM
Roos, Camil N.	PWM

S

Stablein, Francis John	SLA; TMA
Stumpf, Charles Briton	SLA; KST
Smith, Howard Egbert	SLA; TFT
Smith, William H.	FLR
Semple, John C.	FRF
Sproull, William Cargill	SLA; CRI
Strickland, William Kimball	SLA; TMA
Studley, Ralph Austin	SLA; TFT
Strain, Cranford L.	FRF
Smith, Paulding	PWM
Sherman, Alza C.	PWM
Sutherland, Alexander Gordon	SLA; PMT
Shaw, William F.	PWM
Sloniger, Eyir L.	PWM
Spencer, Bonifield M.	PWM
Speer, Dallas M.	PWM
Spilman, Louis	PWM
Stephenson, Arthur W.	PWM
Still, Leslie E.	PWM
Stout, Sidney A.	PWM
Suthers, William G.	PWM
Swift, Charles P.	PWM
Sansbury, Dudley Gordon	FLR
Seawell, John Leonard	SLA; DAF
Shilt, Noble Crawford	SLA; CRI

(*Continued on page* 1134)

A night flying aeroplane. The floodlight lights up the ground to assist in landing the machine

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Tune of Casey Jones

(Apologies)

Come all you crew men, all who can,
And hear about a brave American.
Sergeant Jones was the Sky-Pilot's name,
With a twin-six Liberty he won his fame.

Sergeant Jones,
He mounted to his Liberty,
Sergeant Jones,
With his sky map in his hand
Sergeant Jones he mounted to his Liberty
Bound to take a trip o'er the Hun's land.

He looped over the River Rhine,
His machine gun let out an awful whine,
The Boches knew by his engine's clank,
That the man at the wheel was that damn Yank.

He looked at his altimeter, it was low,
He looked at the rev'lut-ometer, 'twas running slow,
He turned to his observer, and he said,
We'd better climb higher or we'll both be dead.

While flying high he dropped a bomb
It fell square on Bismarck's tomb,
This made the "Flying Circus'" men rave,
Who said, "We'd fight him BUT he's too brave."

His body now lies in a little graveyard,
'Course his kin folks take it awful hard,
But he gave his life for that Liberty,
And helped make the world safe and free.

He was not a Chaplain, He was a Sergeant.

W. B. Jones,
Galveston, Tex.

Mistakes We Make

Irate Lady: That attendant over there doesn't act as couteous and obsequious as he should. I wish to report him.

Hotel Clerk: Then you'll have to write his commanding officer a letter, madam. He's in naval aviation.—*Sun-Dial.*

Lines to a Cherished Correspondent

"—and then he dropped like a plummet."—*Last line from any account of any aeroplane accident in any newspaper.*

It may be that I'll never be
A wearer of "The Wings."
Perhaps I'll never pipe the song
A fighting Fokker sings.

But if the Fates in hours to come
On me with favor stare,
And if my bit of service shall
Be bitted in the air.

I ask you, Sir, who serve the Press,
If I should ever croak,
Remember that my agile ghost
Will never take a joke.

Write in your yarn that I was punk,
And then misspell my name;
Insert a picture of my mug
Snapped at a poker game.

Add that my coat was bought "on time,"
Or say I had to bum it;
But, mister, don't for Peter's sake
Say I dropped like a plummet!

—*C. L. Funnell, U. S. N. R. F. C.*

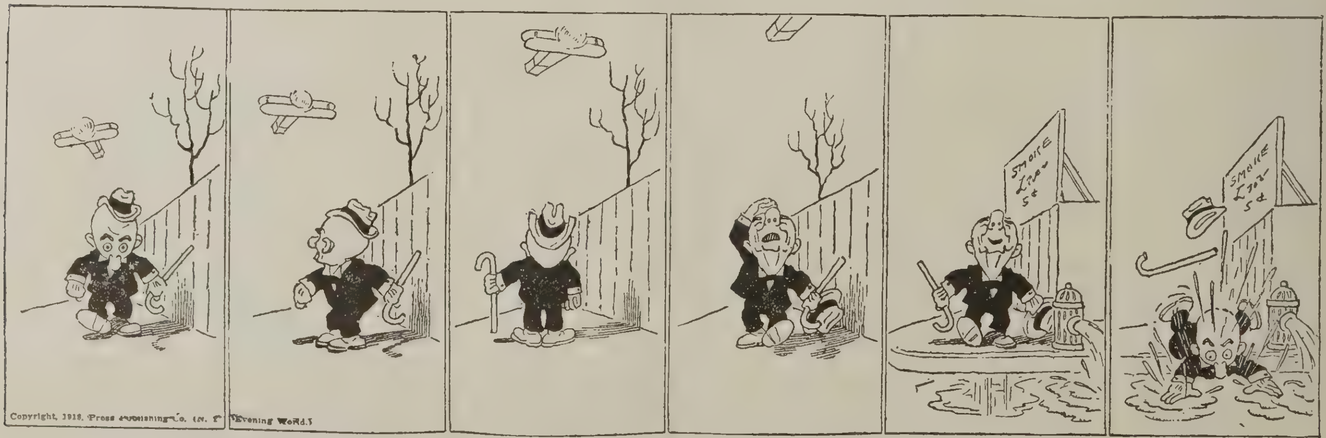
Getting Acquainted

Some day when you have nothing to do
Sit down and think of something new,
And get acquainted if you can
With the new idea of the aviation man.

You'll find a lot of interesting things
Of things you'd never found before,
In strength and weakness, heart or mind,
Of a most interesting kind.

And maybe if you look with care
You'll find some lurking powers there
To lead you to some higher plane
Out of some black cloud of rain.

J. T.


SMOKE
5¢
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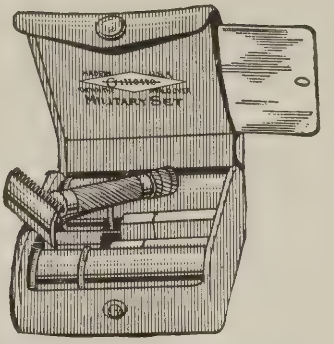
He'd Better Have Been Watching for Submarines.

—By Grindstone George (Courtesy N. Y. World)

Gillette SAFETY RAZOR

The New U.S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅜ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

When a man lives in a place where he can't swing a cat, he comes naturally to a Gillette

The men with the colors, everywhere, know how to shave in 2x4 space—in "once over" time. They know the Gillette makes this easy. Cool, comfortable, and absolutely dependable—the *service razor* with millions of fighting men.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service—men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

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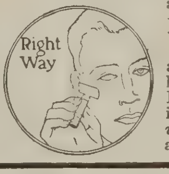
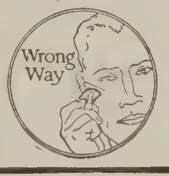
Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in—that's essential with any shave.



Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn*.

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.



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Not only to maintain aerial supremacy over No Man's Land, but to carry the war to Berlin itself—this is the work to which we are dedicated.
Member of Manufacturers' Aircraft Association, Inc.
STANDARD AIRCRAFT CORPORATION
ELIZABETH NEW JERSEY
A REAL FIGHTING INDUSTRY

(*Continued from page* 1131)

Smith, Arthur H.	FRF
Stuart, George D.	FRF
Spiner, Louis H.	FRF
Swain, William M.	CPR
Stoffer, Charles T.	FRF
Schenck, John T.	FRF
Symons, Thomas W.	CWT
Scott, Paul C.	SLR; CGC
Schell, Harold Wilbur	SLA; WFC
Spooner, Malcolm G.	SLR; CAF
Sherwood, Lyman W.	FRF
Strother, Samuel P.	FRF
Simpson, John L.	PWM
Sibley, Frederick Merrill	FLA; DAP
Schroeder, Rudolph W.	WFO
Simons, John W., Jr.	DMA
Shaver, George Derrick	SLA; TMA
Saunders, John M.	PWM
Severson, Thor J.	PWM
Slater, Joseph M.	PWM
Smith, Wesley L.	PWM
Starkweather, Ralph	PWM
Steedman, Charles R.	PWM
Swanson, Leonard F.	PWM
Spicer, Orville William	SLA; CFT
Smith, William	DMA

T

Tipton, Andrew R.	PWM
Tracy, Ray P.	PWM
Twining, Albert C.	PWM
Tyree, John W.	PWM
Thieme, Robert B.	FRF
Thurston, William H., Jr.	CPR
Townsend, Edward S.	SLR; CAF
Towner, Walter Landon	SLA; KST
Teague, Newton Nesbitt	SLA; LHV
Tatnall, Emmett R.	Note 7

W

Wright, William M.	PWM
Wright, Joseph H.	PWM
Woodruff, James A.	PWM
Winch, George A.	PWM
Wilber, Harold C.	PWM
Webb, Sigel G.	PWM
Walton, John M.	PWM
Watkins, Lowry	PWM
Wilson, Thomas Addis Emmet	SLA; PFO
Weddington, Leonard Dickson	SLA; TFT
Webb, Harold W.	ALF
Weightman, Harry Emerson	SLA; CWT
Welch, Paul R.	MAT
Wharam, John Joseph	SLA; KST
Winston, Frederick H.	FRF
Woolson, Lionel M.	CAP
Waring, Charles T.	CGC
Wachtell, Philip A.	EOT
Wimer, Frank Benjamin	SLA; KST
Walker, Lambert R.	FRF
Whitall, John	SLR; TFT
Whitescarver, James F.	SLR; TFT
Williamson, Cleburne M.	FRF
Wright, Edmund C.	FLR
Wheeler, Frank I., Jr.	FLR
Whitaker, Frederick S.	SLR; CAF
Weaver, Van J.	SLR; DIK
Wolfe, Kenneth B.	SLR; DIK
Winkworth, Eugene H.	CWT
Weiser, Victor A.	FRF
Williams, Fred J.	SLR; CAF
Wilkins, Charles H.	DIK
Wood, Benjamin F.	DIK
Wood, Robert Abel	SLA; WFO
Warner, Robert Montell	SLA; CRI
Wood, Lawrence Dresser	SLA; PFO
Whitehill, Deane W.	DIK
Williamson, Harlan Actus	SLA; CAF

Y

Young, Victor M.	DIK
Young, Samuel H.	SLR; CAF
Young, Ora W.	PWM

Kill Flies to Get Leave

Camp Wadsworth, Spartanburg, S. C.—Fifty dead flies is the price that enlisted men of the camp quartermaster's department now have to pay for a pass to come into the city. As a result, when a man wants to come into town on pleasure he purloins a few grains of sugar or some other delicacy from the kitchen, seizes his trusty swatter and sets to work.

"Do and "Don'ts" for our New Arrivals

For the new men just coming into the service from civilian life there may be many stumbling blocks ahead. A few words of advice in time often save many blunders. Through the "Fly Leaf," then, an officer of the school desires to tell of some of the "do" and "don'ts" which should be the guideposts in an army man's life.

Here are some of the more important things which you should do:

Learn immediately to obey the orders of your superiors without question. When you receive an order from one of your superiors, carry it into effect immediately, no matter whether you think it right or wrong. If it later proves to be wrong, the matter will be righted. But never hesitate when given an order, no matter what the circumstances.

Be a Gentleman

Remember that you are now a representative of the United States Government, and a member of the greatest and grandest army ever formed in the history of the world. The best and most beneficent the world has ever known. As a part of that army it is your stern duty to do all in your power to maintain its high standing, both among military men and civilians. It is the obligation of every soldier to be a gentleman at all times and to bear himself with the dignity which becomes the profession of arms.

Enter into your new work of training with a resolution that you will leave no stone unturned until you have perfected yourself in every detail of the task assigned you. Thoroughness and never ending energy will win you promotion and will give you the satisfaction of realizing a duty well performed.

Some "Don'ts"

Here are some of the "don'ts."

Do not shirk your duty, no matter how trivial it may seem. The man who does more than he is asked always gets the farthest in the end. Do not try to imitate some of the types of soldiers you may have seen in motion picture films. The modern soldier is not a wild man, nor a cow boy. He is a gentleman, going about the performance of his work as any other business man would.

Do not grumble. Times will come, some day, when things may not exactly suit you. Anyone can smile and get along when all is pleasant and easy, but remember that "the man worth while, is the man that can smile, when everything goes dead wrong." Remember that it is a part of your duty to keep up the spirits of the men around you, so bury your own worries and do your best to help the man who bunks next to you.

Teamwork Wins

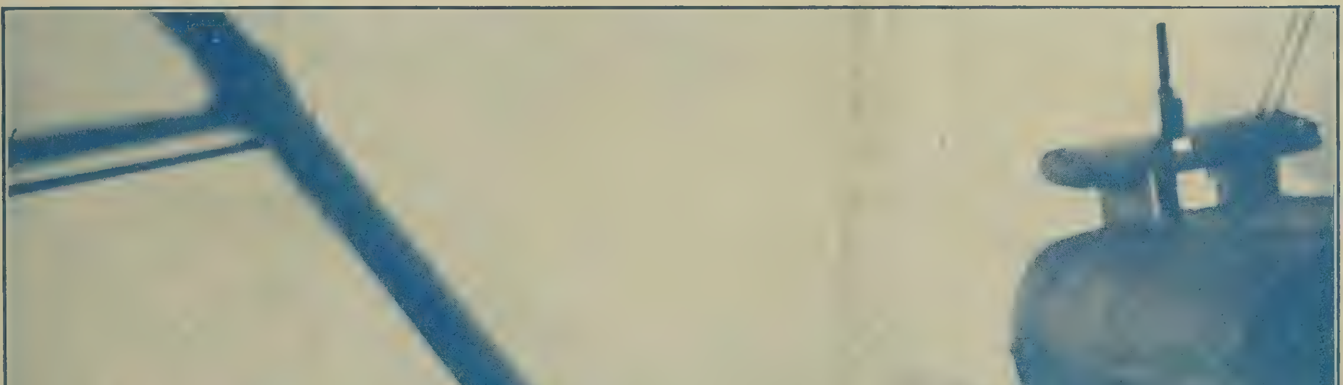
Do not forget that we are going to win the war by teamwork. Fit yourself into the harness of the big army team and pull for all you are worth.

If you follow out these main principles and keep your eyes and ears open to observe the advice of your superiors in the service, your new army life will prove a pleasant one, and you, in turn, will be the better fitted to serve the cause in which we are all engaged.

March Field "Fly Leaf."

AERIAL AGE
WEEKLY

Vol. 7, No. 24 AUGUST 26, 1918 10 CENTS A COPY



A flight of Handley Page bombing air cruisers taken from one of the machines. The cruiser seen in the distance is probably the leader of the V-shaped flight. The photograph was taken from the rear cockpit. The pilot and two machine gunners can be seen in the forward one. The camera has caught the swiftly revolving propeller blades

NOTICE TO READER
When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
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A. S. Burleson, Postmaster-General

Liberties Over the Line

Great Britain's Remarkable Achievement

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VOL. VII NEW YORK, AUGUST 26, 1918 NO. 24

LIBERTIES OVER THE LINE

WASHINGTON, Aug. 16.—General Pershing notified the War Department today that early in August a complete squadron of eighteen De Haviland Four aeroplanes, built in the United States and equipped with Liberty motors, successfully carried out the first reconnoissance flight of American-built machines behind the German lines. They returned without loss.

In making this announcement, Secretary Baker said that Brig. Gen. Foulois of the American air service led the expedition. This was the first report from General Pershing on the performance of American-built De Havilands to be made public.

Secretary Baker said that his advices contained no other information regarding the flight except that Lieutenant Blair Thaw also was on the trip.

The announcement was considered by officers as setting at rest rumors that the De Haviland machines were not a success, and also as showing that the Liberty motors had now proved their worth in actual war conditions.

Whether the squadron was attacked was not stated. It would have been well able to take care of itself, however, as the machines, each carrying a pilot and observer, are equipped with four machine guns by a recommendation of General Pershing made many months ago. The flight undoubtedly was a scouting trip, and probably many photographs of the enemy's works were brought back.

It is assumed that the squadron mentioned is now regularly operating at the front, which means that a large number of reserve and replacement De Havilands are ready behind it. Probably General Pershing has now at his disposal the majority of the craft of this type so far produced.

Many of the criticisms of the De Haviland Fours, it is understood, are met in the design of the De Haviland Nine. With full information available this time American engineers have been able to prepare carefully for the substitution of the Nines for the Fours. The Nines do not represent any notable change from the Fours, the latter model being a refinement of the earlier machines. Both are two-seated, high speed day bombers, equipped either to fight, bomb or scout, under conditions that require high speed and easy maneuvring qualities.

GREAT BRITAIN'S REMARKABLE ACHIEVEMENT

THE reports of one year's achievements of the British Air Forces shows a most remarkable balance. Over four thousand German planes were brought down by British aviators, while the German aviators only brought down one-third that number of British planes.

A cable from London gives the figures of British achievements for the past week as follows:

"London, August 17.—The past week has been one of unexampled air fighting in the west, of which material results are disastrous and disquieting to Germany.

"The air offensive started in the very early hours of Thursday morning, August 8, when under the cover of darkness a number of British bombing squadrons dropped heavy loads of bombs upon the enemy's battery positions and other military points. Then, at dawn, British fighting scouts attacked the enemy, cooperating with the ground forces, and materially assisting their rapid advance.

"Some of the heaviest air fighting of the war took place between Albert, Amiens, and Roye Road, where the enemy's air forces were considerably augmented. Shortly after the opening of the battle forty-eight enemy machines were destroyed and seventeen others were driven down out of control. Fifty British machines failed to return. A marked weakening of the enemy's resistance in the air was speedily noted.

"During the six following days, 185 enemy machines were destroyed, and 89 driven down out of control, and 123 British machines were reported missing. The total number of German machines put out of action is 339. In addition the British bombing squadrons throughout the week have attacked the enemy's aerodromes, railways, and other communications, dropping more than 320 tons of bombs and causing great damage, both to military material and to personnel. Much valuable help was also given to the more advanced bodies of the British infantry and to the cavalry and tanks by the low-flying British scouts, which ceaselessly patrolled the battlefield, raking the already congested roads of the retreat with machine-gun fire.

A notable feature of this phase of the operations was the practically continuous bombing of the enemy's bridges on the Somme, both by day and night. In this respect the admirable experience, gained by the British airmen during the fighting on the Piave, was applied with signal success.

"It also is noteworthy that, quite apart from the air fighting on the western front and in Italy, the Balkans, Palestine, and Mesopotamia, British attacks by air upon Germany's right and left flanks have been pressed with the utmost vigor.

"Thus, in Belgium over thirty tons of bombs have been dropped, many direct hits being made and a number of destructive fires started. The Ostend docks, Bruges docks, and the mole at Zeebrugge have been repeatedly bombed with good effect, while successful attacks have also been made upon Blankenberghe, Ghistelle, Ghent, Westende, and Nieuport.

"An R. A. F. independent force has also made a number of raids into German territory, attacking the stations at Karlsruhe, munitions works at Rombach, railway triangle at Metz, stations at Offenberg and Thionville, and an enemy aerodrome at Hagenau. On August 12 a most successful raid was made upon the aeroplane and chemical works at Frankfort. Moreover, on August 11, R. A. F. contingents, working with the navy, successfully attacked a Zeppelin over the North Sea, bringing it down from a great height in flames."

SHIPPING AIRCRAFT A CARGO PROBLEM

Washington, Aug. 17.—In a statement issued tonight the War Department tells of the difficulties in connection with the shipment of aeroplanes to the seaboard and thence overseas.

"The shipment of our American-built aeroplanes has become a problem," says the statement. "It involves the transportation of an immense aggregate weight, and demands a great amount of space. Planes and their accessories are so delicately constructed that they require careful packing and strong boxing, and the boxes must be so built that they may be taken apart on the field without injuring the units, and used for repacking again, like a wardrobe trunk.

"Studies of the plane boxing and shipping problem have resulted in a material saving of lumber and shipping space. In shipping the American De Haviland bombing planes alone, for example, 644 cubic feet of space have been saved, over former methods, for every plane sent. This amounts to a cost saving of about $3,864 per plane, figuring on shipping space at $6 per cubic foot. About 1,000 board feet of lumber have also been saved in boxing by the Packing and Boxing Section of the Production Department.

"In the case of the De Haviland battleplanes, nine packing boxes are required to ship four complete machines. The gross weight of four aeroplanes is a little over 11,000 pounds, and when packed the total weight is estimated a little under 27,000 pounds. Four of the nine boxes contain front sections of the fuselage. One of them contains four rear sections, two contain two sets of wings each; one, four sets of rear contral, and one, four sets of ailerons. The total space required for four aeroplanes so crated is 3,547 cubic feet. In addition to the parts actually required to complete the four aeroplanes, spare parts are also shipped. Two main wing boxes are sent with each unit shipment of four planes. This box contains, besides the wings, with their fittings, axles, wing skids, landing gear, wiring plates, wheels, tires, struts, and fittings. One aileron box is also sent with each shipment of four planes.

"All boxes are lined with waterproof paper and the tops covered with tarred felt fastened down on the sides and ends. All the joints are sealed with cement, and the exteriors are given two coats of paint. Minute directions are given for packing the various parts of the aeroplanes. Braces and supports within the box are so constructed as to support the motor and fuselage. Metal parts which might corrode are protected by a neutral slushing compound which is resistant to the effects of sea air and salt water. The instruments on the instrument board are heavily covered with a coating of paraffine. The more delicate instruments are removed and packed carefully in special boxes, which in turn are sealed in airtight tin boxes.

"Shipments of spare parts for 100 De Haviland planes requires 105 cases, weighing approximately 164 tons. With every plane there are also shipped two Marlin synchronizing machine guns, operated by pilot, and two Lewis flexible machine guns, operated by gunner; camera, attachments for a radio set, sent separately; heating and lighting equipment, bombing equipment, and a great many instruments, such as air pressure gauge, oil pressure gauge, aneroid barometer, clock, compass, map case, fire extinguisher, pilot's safety belt, gunner's safety belt, and Very signaling pistol."

DEPARTMENT OF LABOR, U. S. EMPLOYMENT SERVICE

Managing Editor, AERIAL AGE,
New York City.

Dear Sir: We beg to direct your attention to the plans of the U. S. Employment Service, and to the great effect which this program will have upon the industrial life of the Nation.

On August 1, the supplying *of war industries* with common labor will be centralized in the U. S. Employment Service of the Department of Labor, and all independent recruiting of common labor by manufacturers having a payroll of more than 100 men will be diverted to the U. S. Employment Service. This is in accordance with the decision of the War Labor Policies Board and approved by the President on June 17. (The War Labor Policies Board is composed of representatives of the War, Navy, and Agricultural Departments, the Shipping Board and the Emergency Fleet Corporation, the War Industries Board, and the Food, Fuel, and Railroad Administrations. Its chairman is Felix Frankfurter, Assistant to the Secretary of Labor.)

The above action was found necessary to overcome a perilous shortage of unskilled labor in war industries. This shortage was aggravated by an almost universal practice of labor stealing and poaching.

While the restrictions against the private employment of

(*Continued on page* 1186)

The noted Allied aviators who are touring the Middle West with the Flying Circus. From left to right they are: Seated—Lieut. F. E. Welsh, Brigadier General Charles Lee, Major C. K. Rhinehardt, Captain J. A. Hannay, Lieut. H. E. Watson, Lieut. Earl Carroll. Standing—Lieut. M. B. Kelleher, Lieut. J. S. Reitenbaugh, Captain G. D. Hunter, Lieut. L. A. Clarke, Lieut. S. M. Connell

THE NEWS OF THE WEEK

Provisional Wing and British Flyers Arouse Great Interest in Aeronautics

THE Provisional Wing and British aviators have started on their aerial tour to arouse interest through the country.

Major C. K. Rhinehardt, the commanding officer of the Provisional Wing, and Lieutenant M. G. Cleary had a rough time flying to Dayton.

Dayton, Ohio.—Ten American aeroplanes left their hangars at the Wilbur Wright Aviation Field at 10 o'clock on Aug. 14 for the first leg of the 3,000-mile flight around the central western states as an educational campaign in the interests of progressive aviation.

The machines started for Cincinnati, where they were joined by three British machines under Brigadier-General Lee, R. A. F.

Major C. K. Rhinehardt of Hazelhurst Field, Mineola, L. I., led the American flying circus. He arrived here late on Aug. 13th after a 700-mile flight from Mineola.

Starting from Mineola in his famous Skull and Crossbone Curtiss "H" with Lieutenant M. G. Cleary at noon on August 12th, they made their first landing at the Aerial Mail Field at Philadelphia. From there they flew on to Dayton, Ohio, landing en route at Sunbury, Pa., Altoona, Hollidaysburg, about thirty miles from Pittsburg, and New Philadelphia, Ohio. They arrived at Dayton at 8 p.m. August 13th. The actual flying time was about seventeen hours.

Flying over the mountains, which they did at about seven thousand feet, they experienced considerable "bumpiness" of the air.

The flying circus, which arrived at Cincinnati from Dayton on the evening of Aug. 14, for the first leg of the Western tour, comprised 6 Curtiss H machines, 2 Thomas Morse scouts, and three Avro planes. Included in the party, which was under the command of Major Rhinehardt, were Brig.-Gen. Charles Lee, Captain Hannay and Captain Hunter, of the British Aviation Mission.

The American fliers were Major Rhinehardt, Captain Fred H. Harvey and Lieutenants Earl Carroll, J. B. Boyd, Floyd E. Welsh, J. S. Reitenbaugh, Wesley Benner, H. E. Watson, M. B. Kelleher and S. M. Connell. All of the men are pilots and have completed their training both at training fields and at Mineola. The party purpose returning to Dayton, where they will give demonstrations of air fighting and maneuvers. The aviators of both parties will be entertained by the Greater Dayton Association.

The purpose of the tour of the aviators over the middlewest states is to show what has been done by the British and what will be done by the Americans, when they get over the lines in Germany. The Mineola field, where the aviators came from, was established for the purpose of giving the American fliers the training in this country that they would otherwise have been forced to get in France. Instead of the preliminary work over there, they are getting the same thing at the Long Island field, under instructors that have been through the battles with the Huns.

All Cincinnati paid tribute to the late Captain James Fitz Morris of the British Royal Air Force, who was so unfortunately killed in the flight across country with the Flying Circus, on August 14th. Crowds lined the streets while the cortege passed on its way to Memorial Hall, where funeral services were held. Many floral offerings were dropped from aeroplanes flying overhead, and these were placed on the gun-carriage on which the casket lay draped with the British and American flags. Captain Morris flew a Sopwith Camel equipped with 130 h.p. Clerget motor.

General Lee flies his favorite aero equipped with the 100 h.p. monosoupape Gnome motor and Captain Hannay flies a two-seater Bristol fighter equipped with a 275 h.p. Rolls-Royce. The American Curtiss planes are equipped with 150 h.p. Hispano-Suiza motors.

Jos. Pulitzer, Jr., In Aviation

St. Louis.—According to a despatch from Washington Joseph Pulitzer, Jr., of St. Louis, editor of the St. Louis *Post-Dispatch* has enrolled there in the Naval Aviation Corps, ground service, after being rejected in the flying service on account of poor sight.

Lieut. Harry V. Reynolds, engineer officer at Rockaway Naval Air Station, Long Island

The Aeroplane Expert in speaking of this machine said he thought it was the first German machine with five motors that had been brought down intact by the British.

"The engines," he said, "were of the Mercedes type, developing 220 Horse Power each, this making an aggregate Horse Power of 1100. This has not altogether come as a surprise to us, as we have been aware for some time of the existence of some of these five engine motors, in addition to many of the enemy giants which have four engines, developing high power for night-bombing. There is nothing very extraordinary in five engines it is merely a case of standardization."

Official Statement Regarding the De Haviland 4

An authoritative statement has been received from the Committee on Public Information by Aerial Age in regard to the much discussed De Haviland 4. This statement, which follows, should clear up in every respect the many rumors regarding this plane:

"The De Haviland 4 is a two-seater, general fighting machine developed in England and can be used with slight modifications for fighting, bombing, reconnaissance or photographic work. It has a speed of upwards of 125 miles an hour and is able to carry a considerable load of bombs. if necessary. The earliest shipments of the 4 had a number of defects which have since been remedied, some of the remedies being requested by General Pershing. Today these 4's are being shipped across in considerable numbers, shipments being requested regularly by cable from General Pershing. This machine is now being manufactured by three different factories. An American adaptation of the De Haviland 4, called the De Haviland 9, is also in the early stages of production."

Our Aviators Win 5 More Victories

With the American Army in France.—Capt. Charles J. Biddle of Andalusia, Pa., is the latest American aviator to down a German aeroplane. While out with a patrol on Aug. 15 Capt. Biddle met three monoplanes north of Flirey.

The Americans attacked and one of the German machines fell, apparently out of control. It vanished in the mist, so that Capt. Biddle's victory has not yet been confirmed.

Lieut. Vaughn R. McCormick of Columbus, O., got his second official German aeroplane on Aug. 14th, when he engaged the enemy in the air north of St. Mihiel.

French observers have confirmed the destruction of the German.

Another enemy machine was shot down Aug. 10 by Capt. Ray C. Bridgeman of Lake Forest, Ill., near Xivray, in the destruction of which Lieut. McCormick also shares officially.

Additional American victories in the air include a monoplane, apparently shot down by Lieut. Herman Schultz of Bettendorf, Ia., which went down in a steep dive through the clouds over Flirey after 375 shots had been fired at it, and a biplane attacked by Lieut. Edgar C. Tobin of San Antonio, in the vicinity of Evvezen. Confirmation is being sought for both these victories.

Aug. 14th was the most active day in the air for some time along the American battle front. One of the American planes attacked a German Rumpler machine and fired one hundred shots into it. The German disappeared, but apparently was under control. Another American machine forced a German to run for his life.

Defends De Haviland Plane

Washington.—The aircraft production investigation by the Senate Military Sub-Committee, which began about two months ago, was concluded on Aug. 15, with a statement from John D. Ryan, Chairman of the Aircraft Production Board.

Mr. Ryan expressed confidence that the De Haviland aeroplane, as it is being improved, will be a most satisfactory machine. He said he regarded as unjustified the many criticisms against it which have come competitors and others. This machine, he added, is now the principal one in quantity production and should not be abandoned.

New German Identification Mark

From a German source the Nieuwe Rotterdamsche Courant learns that a change has been made in the marking on German machines. The arms of the black cross are now straight—and not curved—with white edges. The change is said to have been made because the previous form made recognition of German machines very difficult, and because it easily led to confusion with the circular signs on hostile aeroplanes.

First Message Carried By Pigeon

Flying 27 miles in 21 minutes, the first Ellington field trained carrier pigeon made its initial flight carrying a message. The bird was released at Y. M. C. A. building No. 49 at Camp Logan and carried a note from D. S. Burke, the religious work director of that building, to Carl Barnett, building secretary of the upper field "Y" at Ellington.

The message was as follows:

"Congratulations for the new building."

The carrier was released by Corporal Knell of the pigeon detachment, who has had charge of its training. Mr. Burke was not at all confident that the bird would deliver the message, and was much surprised when he learned that it had reached its destination in such a short time.

The Latest Hun Bomber

Mention was made in General Haig's report of August 11th that a hostile night-bombing aeroplane had been brought down by fliers of the Royal Air Force. This machine was of the large bombing type and was equipped with five motors.

Transfer Made By Aeroplane

What is said to be the first instance on record of an officer transferring and reporting to his new station via air-route, was accomplished when Lieutenant Jay Howard Cather, formerly adjutant of the 499th Aero Squadron made a flight from Langley Field to Camp Lee, Va.

A feature of the trip was that the time was only 44 minutes from start to finish and was without mishap. With Captain Carolin as pilot, the officers left Langley Field at 11:30 a. m. and arrived at Camp Lee at 12:14 p. m. Quite a sensation was caused by the arrival of the party on wings. As one by-stander remarked, "What chance has Germany got when America is beginning to discard railroad trains in moving her troops. Next thing we'll hear will likely be that each man will be issued an aeroplane and the whole army will go to Berlin on wings."

U. S. Air Pilots Wear Unique Insignia On Battle Planes

Upon arrival at the headquarters of the First Pursuit Group, one is surprised to see how comfortable and cozy the pilots and mechanics are housed—and so close to the line that the roar of the guns is always heard. Intermittently, during the day and gradually increasing to such volume at night, one not used to it has difficulty in getting any sleep.

Each squadron has its own quarters, with separate kitchens and mess halls. The officers of each squadron have a private mess as well as headquarters. A representative of the *Plane News* was fortunate to dine with two of the squadrons and meet the fliers whose names are known throughout America.

The 94th Squadron has adopted an insignia that is painted on each side of every one of their planes. It is a large ring with Uncle Sams hat in it, and is typical of the squadrons record to date, they having officially accounted for the downfall of 18 Boche and hungry for more. An additional feature of the insignia is the small iron crosses dropping into the hat for each one of the Boche accounted for.

Another squadron of the same group, the 95th, has as their insignia a kicking mule. He is balanced on his fore feet, ears laid back, and doubled up in the act of letting go, preparatory to driving someone into Kingdom come. This squadron has used their "trade mark" in a unique manner in the decoration of their mess hall. Around the walls, near the ceiling, kicking mules are painted and on each mule the number of the pilot is shown and below an iron cross is painted for each Hun that particular pilot has shot down. If a pilot had brought down a Boche with the assistance of some other pilot, or in what they call a gang fight, a white horse shoe is painted around the cross. Number sixteen mule, that of Lieut. Casgraine, has a white border painted around it, which signifies he has been captured; another, number five, that of Lieut. Blodgett, has a black border, signifying his death.

A further feature of the mess halls are the trophies which are hung on the walls, consisting of parts of Hun machines brought down. Among them are facsimiles of the iron cross cut from the wings, revolvers, signals, control sticks, the rudder of the first machine brought down by Lieut. Campbell, machine gun, and the barrel of another bearing the following inscription "Barrel of Spandau Mitrailleuse which shot at Lieut. Campbell and was strafed therefore."

The First Pursuit Group today has accounted for 24 Hun planes, which means two entire squadrons have been wiped out. This is a remarkable record, considering that most of the pilots have been trained exclusively in American aviation schools and speaks well for the thoroughness of the training they undergo.

The success of the First American Chasse Group has given them a confidence and Esprit de Corps that will carry them through many a future fight. At present they have absolute control of the air in the sector they occupy. The few Huns seen refuse to fight, turning tail when the Americans come in sight.—*Plane News.*

Cleveland Sees Air Battle

Cleveland.—The "Flying Circus" of British and American military aviators thrilled hundreds of thousands of persons here with their exhibition of tricks in the air. Brig.-Gen. Charles Lee did various stunts, and Lieuts. Welsh and Connell in scout planes demonstrated an air battle for forty-five minutes at an altitude of about 3,000 feet. Six machines in battle formation made a cross-city flight.

Aero Mail Growing

Aug. 17th closed the first week of operation of the Aero Mail Service by the Post Office Department, with civilian aviators as pilots, and it proved a perfect week in the matter of trips. There was no interruption in spite of several storms, for the mishap to Aviator Maurice Newton's machine on Monday caused no delay. He landed at Hillside, a half mile east of Jamaica, instead of at Belmont Park, and Supt. H. L. Hartung of the Belmont Park Station reached the scene in a motor car in time to send the mail to New York on time.

Ensign R. R. Bottoms, U.S.N.R.F., the Hydrogen engineer at the Rockaway Navy Air Station

Earl Carroll—Caruso's Partner in Song Writing and Only American Composer—Now Full Fledged Lieutenant in U. S. Aviation Corps

Lieut. Earl Carroll, youthful American composer of popular musical comedies, such as "So Long Letty," "Canary Cottage," and others, now in Uncle Sam's Aviation Corps. Carroll enlisted at the beginning of America's entrance in the war, giving up an income of over $50,000 annually, and is now a member of the 1st Provisional Wing at Mineola.

Carroll is a Pittsburgh boy still in his early twenties. Just before enlisting he had completed a $40,000 bungalow on a New York skyscraper, where he and his bride had honeymooned. The photo shows Mrs. Carroll, a little French lady, who has four brothers at the front.

AMERICAN AVIATION REPORTS

American Fliers In Raid

Washington—American aviators have conducted successful raids on the railroad yards at Conflans, Longuyon, and Dommary Baroncourt, General Pershing reported in his communiqué for yesterday, which was made public tonight by the War Department. The text of the statement follows:

"Section A—Aside from the intermittent artillery activity there is nothing to report from sectors occupied by our troops.

"On Aug. 11 and 12 our aviators successfully bombed railroad yards at Longuyon, Dommary Baroncourt, and Conflans. All our machines returned."

Two Aeros Felled.

With the American Army in France, Sunday, Aug. 11. (By the Associated Press).—Two German aeroplanes have been brought down by American flyers in the last 24 hours on the Toul sector. Official confirmation, however, is still lacking. A third is believed to have been brought down.

The first German shot down was the victim of Capt. R. C. Bridgeman, of Illinois. The machine was seen to fall in flames near Xivray Saturday.

Saturday night a patrol of American flyers met four German biplanes near Thiaucourt. Lieut. Tobin attacked one, and it went down into a nose dive.

The reported second victory occurred Sunday morning near Thiaucourt in an air battle between three German machines and several Americans.

Display of Trench-War Devices

Trench warfare devices of many types were demonstrated in Washington on July 11 before a gathering of War Department officials, Army officers and members of Congress as guests of the trench warfare section of the Ordnance Bureau.

The scene of the demonstration was the rifle range in a secluded valley of the hills that surround the capital. A feature of the display was the dropping of actual bombs from a De Haviland "4" day bomber, the machine equipped with the Liberty motor, now being produced in quantity for the use of American aviators in France. The rifle range lies down at the foot of a steep hill, on the top of which several hundred invited guests were gathered. Below them, from sand-bagged trenches, offensive and defensive hand grenades and rifle grenades were fired by salvos and in barrage. A row of figure targets, representing a charging line, was battered to pieces in a hail of grenades, showered over a ten-foot embankment. Switching to incendiary grenades, the firing party scattered fire over the grass in all directions and in another moment were showering a supposed advancing enemy with gas grenades. Moving out of the shelter, the squad started forward under a dense cloud of white smoke rising from the smoke bombs hurled ahead of them.

The hum of a motor, high overhead, announced the coming of the bombing machines. The first bombfi containing many pounds of high explosives, landed in the woods, bursting with a terrific concussion. A second tore a great hole in the center of the range, and a third dropped on a target butt, tearing out a thirty-foot crater. Other bombs contained inflammatory material and splashed the earth with flaming fragments.

American Aviator Beats Five Austrians

Italian Army Headquarters In Northern Italy—Lieut. Willis Fitch, an American aviator, is being congratulated by Italian air experts for his excellent handling of a bombing plane when five Austrian scout planes attacked him. Lieut. Fitch's machine was one of a bombing squadron intercepted before it reached its objective inside the enemy lines.

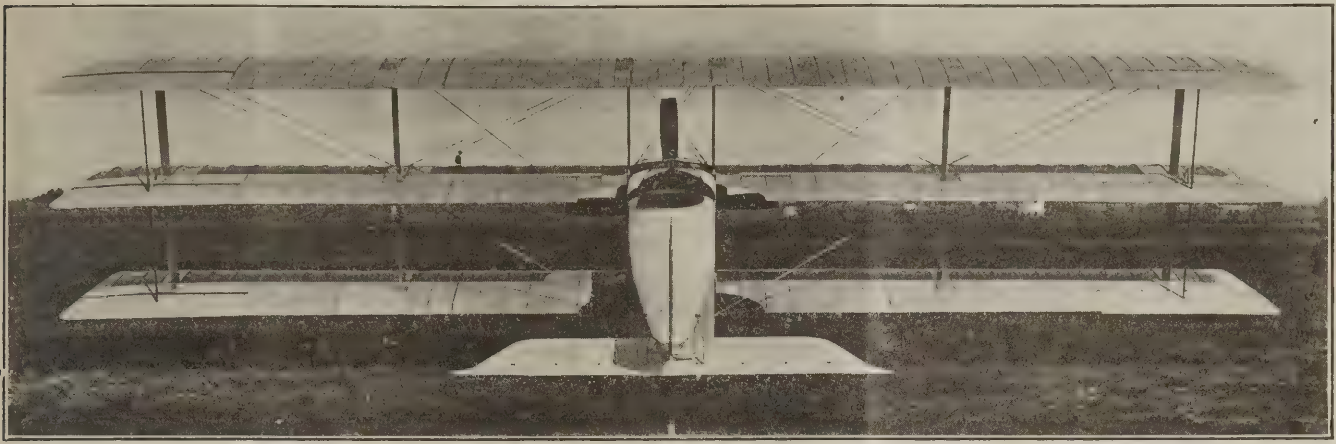
When Lieut. Fitch observed enemy planes arising to attack he dropped his bombs on two of their aviation camps and started back for the Italian lines. While still about thirteen miles inside enemy territory the five Austrian scout planes overtook him from the rear. He was without support, as others in his formation had preceded him toward the home hangar.

Lieut. Fitch dived to obtain maximum speed and then pursued a zig-zag course in the race for the Italian lines. Meanwhile his machine gunner maintained bursts of fire at the pursuers.

One enemy plane came down in a dashing attempt to destroy the bombing plane and passed within twenty-five feet. The enemy's fire was inaccurate, but that of the Lieutenant's machine gunner was true and the scout plane went into a swirling nose dive to the earth.

The four other Austrian airmen attacked in turn from varying distances, but the fire from the bombing plane each time frustrated their attempts. Finally, Lieut. Fitch's escort saw his predicament and returned, driving away the Austrian scouts.

(*Continued on page* 1193)



Rear view of the "baby" Caproni

GALLANTRY OF AMERICAN AIRMEN ABROAD

ONE of the dominant notes in the symphony of good news from abroad has been the gallantry of our air forces. On the French front, in General Foch's offensive, the effective work of our fliers has been related daily. Italy, too, has weighed American aviators and found them not wanting in helping to drive the Austrians back across the Piave.

Gianni Caproni, the Italian inventor whose monster bombing biplanes and triplanes are now being built in this country and equipped with Liberty engines, has given testimony about the American airmen on the Italian front in a letter just received by Lieutenant Leopold Belloni, who is Caproni's official representative in this country as well as the representative of the Italian air service. Parts of the letter, translated by Lieutenant Belloni, follow:

"The American aviators have performed truly marvelous things. During the past few days I have had occasion to speak often with Pilot Lemprini, who has been teaching the Americans the art of flying. He never becomes tired of endlessly praising them for their exceptional intelligence, their dash, their gallantry, and their love for the beautiful weapon. They are all very young; from 18 to 26 years of age. They have been welcomed by their Italian comrades with the greatest, the most heartfelt cordiality.

"At the training camp we prepared for them the best possible quarters, furnished with the latest comforts; much better, in fact, than what we do for our own officers. We also provided for them various games for outdoor and indoor amusement. To them has been given a complete technical instruction about the plane itself and about the motors. They have shown great intelligence and diligence, and were so fond of their machines that they took the greatest care of them, trying to learn every detail about construction and manoeuvres; even going so far as to clean their machines personally.

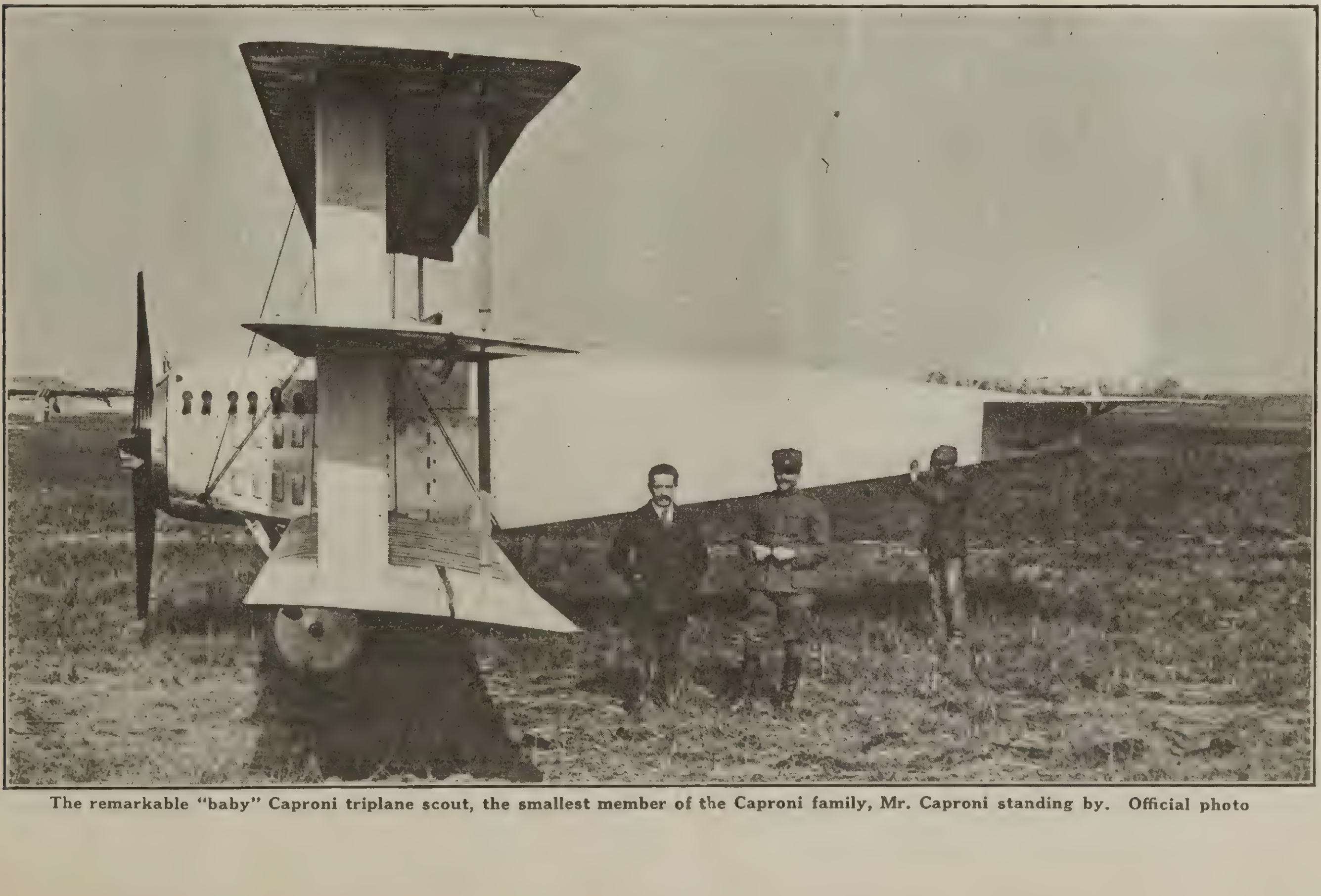
"Their instruction has been made easy by the fact that they all seem to be very clever sportsmen, technically very capable, so that they rapidly become perfect masters in flying. They made their first flights with an old Farman and became so efficient that very shortly they were promoted to be military pilots because of wonderful flights in which they set many records, showing remarkable piloting qualifications.

"Between pupils and teachers there has always been the greatest friendship. The instruction officers never had occasion to give an order; their mere advice was too promptly followed.

"When the American's were permitted to fly the Capronis their enthusiasm knew no bounds. At first they looked somewhat perplexed at the size of the latest types, but when they saw that these giants were as docile, stable, and safe—more so, as a matter of fact—than the other machines, they were positively thrilled, and went at their training with still more enthusiasm than they had shown previously.

"And when they saw their teachers performing with the giant Capronis—not yet seen in America—those evolutions and 'stunts' which they were accustomed to think possible only for small machines, they said, with almost childish eagerness, and they wanted to start immediately to do the same things. And they actually did. They kept their word. They have been flying, both by day and by night, in exceptionally long cross-country raids. They loop over the wings, loop the loop, spin, and do antics that nobody could excel.

"These men have now been sent to the front, and they are covering themselves with the most genuine glory. They are proud and glad to fight for the greatness of their country, for the honor of the United States as well as for the freedom of the world, and are truly deserving of the greatest admiration. They have made an everlasting impression on me, and I am proud to have known them and to have been able to show them personally my admiration and thankfulness for what they are doing as well as for what they are. Among them I remember especially the Hon. La Guardia, MacGilwary, Manchester, Ciny, and many others whose names I cannot recall with she same ease with which I remember their clean-cut, joyful, intelligent features."



The remarkable "baby" Caproni triplane scout, the smallest member of the Caproni family, Mr. Caproni standing by. Official photo

The AIRCRAFT TRADE REVIEW

N. E. J.

Improvement of "Liberty" Motor Rapid

"The Liberty motor is 50 per cent. better than it was six months ago. A like period hence will see even greater improvements in it.

This assertion is made by W. B. Stout, technical advisor, Aircraft Board, in a pamphlet on the problems of aeroplane improvements, issued by the Naval Consulting Board. The board issues an invitation to all persons to aid in the perfection of aircraft, and outlines certain features in which improvements are wanted. Suggestions will be welcomed on carburetion, ignition, engine parts, self-starters, exhaust mufflers, cooling radiators, the fuel system, propellers and machine gun synchronizers.

Noninflammable coverings for wings are sought, as well as stabilizing devices, bomb sighting devices and drift meters.

Our eventual success in the air, according to Mr. Stout, will depend on the ingenuity with which we can produce; first, quantity of aeroplanes, and second, quality. The Germans lead today, he says, in quantity production designs. With regard to the types of planes this is said:

"After the development of flying instruments reached a certain stage, night flying became popular. There is a demand for planes of exceedingly large type capable of carrying tons of bombs and flying at night. This requires them to be stable. These machines should have from two engines up, and should be fitted with illuminating apparatus. Electric lights are not suitable, but magnesium flares have been developed for this purpose. Night flying also involves new problems in protective measures relating to anti-aircraft guns, searchlights and combat tactics.

"Considerable speed can be added to all types of planes."

Here is the navy's invitation to the country to help in the perfection of aircraft:

"Many of the greatest improvements in industry have been made by men who had but little practical experience or technical training along the line in question. But they brought to the task the requisites most needed—a free brain, a clear insight and fresh enthusiasm. Perhaps yours is the mind that will see the way to some great improvement in aircraft, one of the most potent weapons for winning the war. A billion dollars has been set aside for production. We want the best in the world. Any help you can give will be welcomed. Inventions and ideas submitted in reply should be addressed to Thomas Robins, secretary Naval Consulting Board, 15 Park Row, New York."

Finley R. Porter has joined the government establishment at McCook Field, Dayton, O., as aeroplane engineer in charge of engine development. He was formerly chief engineer of the Mercer Motor Car Co., and afterward designer of the F. R. P. cars at Port Jefferson, L. I.

Steel for Aeroplane Wings

It is stated that the Superior Steel Co. in the United States is filling a large Government contract for what is said to be the thinnest sheet steel ever rolled, which is to be used to make wings for American fighting planes for use in France, replacing the present linen fabric wing. The Superior Co. is also making steel-frame rods to support the new wings. The steel for wings is one-thousandth of an inch thick. The new wings are said to be tear-proof, differing from the fabric wings, inasmuch as, though pierced by a bullet, they will not tear no matter what the speed of the plane.

Doehler Die Casting Plant Enlarged

Toledo.—The Doehler Die Casting Co. is expanding its plant to handle Government contracts on an enlarged scale. A 2-story building, leased from the Ohio Electric Car Co. will be used for making rifle and hand grenades, machine gun, gas mask and depth bomb parts, and aeroplane equipment. The Ohio Electric Car Co. has discontinued production, having been classified as a non-essential industry. It is expected that the Doehler company will soon take over a second Ohio Electric building.

U. S. to Make Pursuit Plane

Washington.—Production of a fast single-seater fighting aeroplane will soon be under way in this country; the machine selected is said to be the development of a modern British pursuit plane which has been very successful. Details of construction and performance of this machine have not been made public. Up to this time construction of single-seater fighting machines has not been undertaken in this country, as they have been turned out by the French and British factories for the American Army.

Overland Busy on War Work

Toledo.—The Willys-Overland Co. is now in full swing on the contracts it has accepted from the Government. The first contract was through the Toronto plant with the British Government, for 1,000 Sunbeam aeroplane engines. A quantity of these engines have been manufactured and accepted and actual deliveries are coming along rapidly.

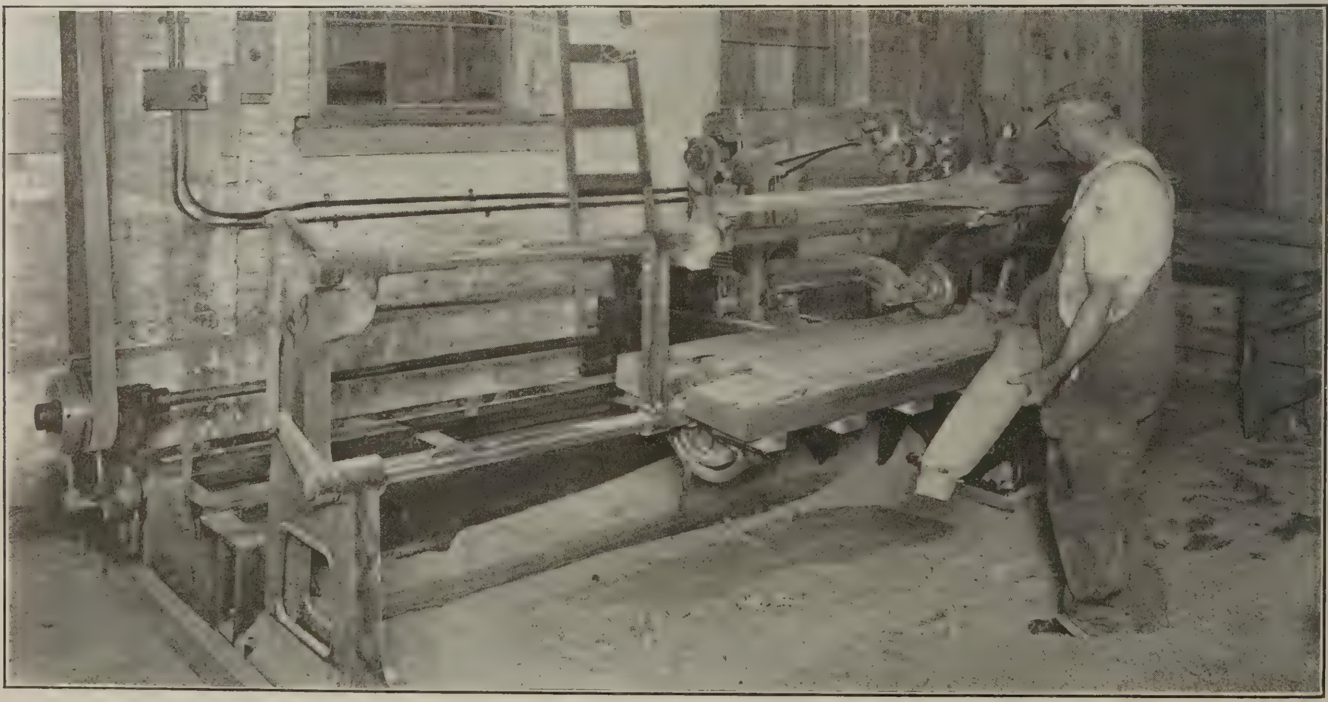
The second large contract was for 5,000 eight-cylinder training engines, for use in training planes at the several cantonments already established in this country. On this contract 835 engines were delivered in March and 1,003 in April. During May and June, according to contract, 1,000 will be delivered each month. Large orders have been received for parts for these training engines.

Guiding a Free Balloon

In the operation of "free" balloons there is no control over the direction taken by the balloon, as the craft must follow the wind direction. By ascending or descending into different air currents, however, an experienced balloonist is often able to maintain a desired direction. A noteworthy example of this took place last week at the balloon field of the Goodyear Tire & Rubber Company, near Akron, Ohio, when a pilot by skillfully following a series of air currents at different altitudes, after a flight of some twenty-five miles, brought his balloon back to the field, landing within one hundred feet of his starting point. In this school are being trained many young men who will soon be piloting aircraft on our battle fronts, and the proficiency they are acquiring augurs well for the carrying out of the American program of supplying "eyes" to its military forces.

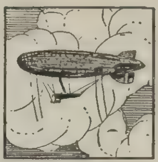
Height at Which Sounds Can Be Heard

In one of his journals Camille Flammarion gives the heights at which sounds from the earth are heard from balloons. The shout of a man was heard distinctly at the height of 1,600 feet, the sharp note of a mole-cricket at 2,500 feet, and the croaking of frogs in a morass at 3,000 feet. At 3,255 feet a man's voice and the rolling of a cart were distinguished; at 4,550 feet the roll of a drum and the music of an orchestra; at 5,000 feet the crowing of a cock, the sound of a church bell, and sometimes the shouting of men and women. Nine hundred feet higher still was heard the report of a musket and the barking of a dog. The noise of a railway train penetrated to a height of 8,200 feet, and the whistle of a locomotive engine to nearly 10,000 feet.



A Fay-Eagan propeller cutting machine in operation at the Holbrook Company's plant

MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

THE accompanying illustration is a very comprehensive one. It will reward careful study on the part of a student of aeronautics by disclosing a great many points in regard to Observation Balloon procedure in France at the present time. The photo was taken in France, that fact the writer can vouch for, for on numerous occasions he has passed this very position.

In the first place, the balloon is a Cacquot type, Model M, and operated by the British Royal Flying Corps. The Balloon is seen here from the stern. It is "on the Winch," that is, in position, ready to ascend. The balloon has been fastened to the cable and the cable to the gasoline operated winch. This winch is built on a Motor truck which can move up and down a road under its own power. Here is seen the winch road. The balloon ascends from this position and when it is at a height the winch drives along the road, closer to the trenches.

The fins of the balloon can be seen to advantage in the illustration. The rudder can also be seen underneath the balloon.

The rudder and the fins are filled with air and perform numerous functions. They keep the balloon head on to the wind; they keep the balloon flying level, and with the aid of the internal ballonet they equalize the pressure of the gas, thus preserving the shape of the envelope.

On the upper surface of the envelope can be seen the mooring guys. These are small ropes which are fastened to the little dark spots on the upper surface. These little dark spots are in reality, rings, sewn to the envelope.

The crew are holding the balloon down to earth by the handling guys, while the telephone is tested and the instruments adjusted by the observers before ascent. The basket, with the two observers in it may be seen below the bag. The white spot to the right of the basket is the attached map-board, which carries the squared map with the enemy positions marked on it.

While a balloon is in the air it is very difficult for the enemy to locate it with their artillery. One would casually think that observation while firing at a balloon would be the most easy thing in the world. Exactly the contrary is the case.

The trouble is caused by the fact that there is nothing to judge the bursts of the shells by. From the position where they were fired nothing can be judged except whether the shells are going straight for the balloon or not. Nothing is known as to whether the shells burst in front of or behind the balloon. Observation from the flank will tell this but flank observation will not tell the truth about the correctness of the line. Cross observation is the only way to shoot up a balloon successfully.

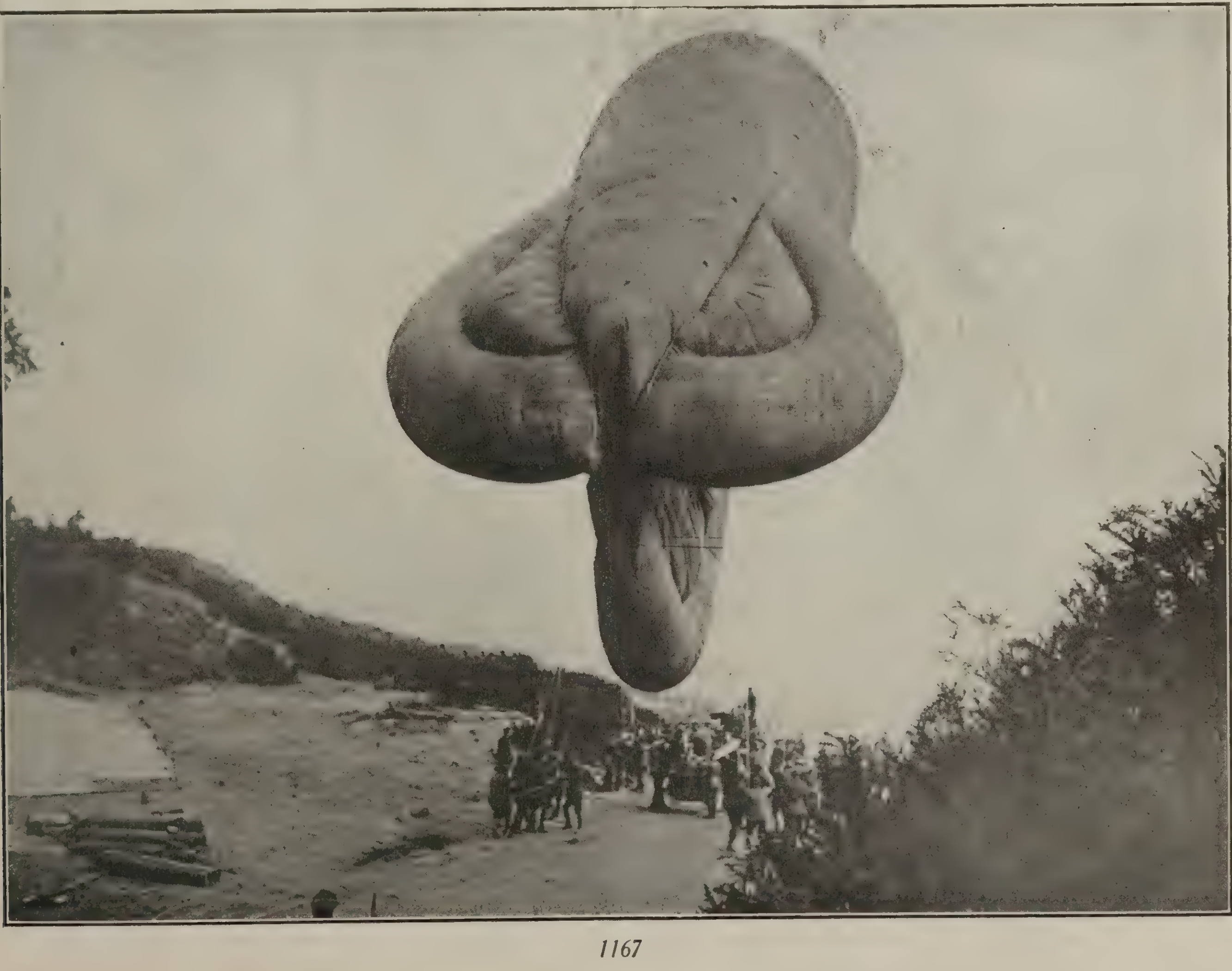
However, while a balloon is on the ground before it gets into the air, if it is seen by the enemy, it is an easy target. Therefore, no time is wasted when a balloon is getting into the air. Everything is carried out with the greatest dispatch. It is good practice to have a sheltered place for the balloon to ascend, sheltered both from the weather and from the enemy. The reader will note in the photograph, how the balloon is concealed by the surrounding hills.

This winch position is very close to the balloon bed. The latter can be seen on the extreme left. The white sheet arrangement is a canvas ground cloth laid and pegged down to the ground, which has been properly prepared for its reception. This tarpaulin not only helps to keep the balloon dry, but it prevents stones, branches, roots and such like from rubbing or puncturing the balloon.

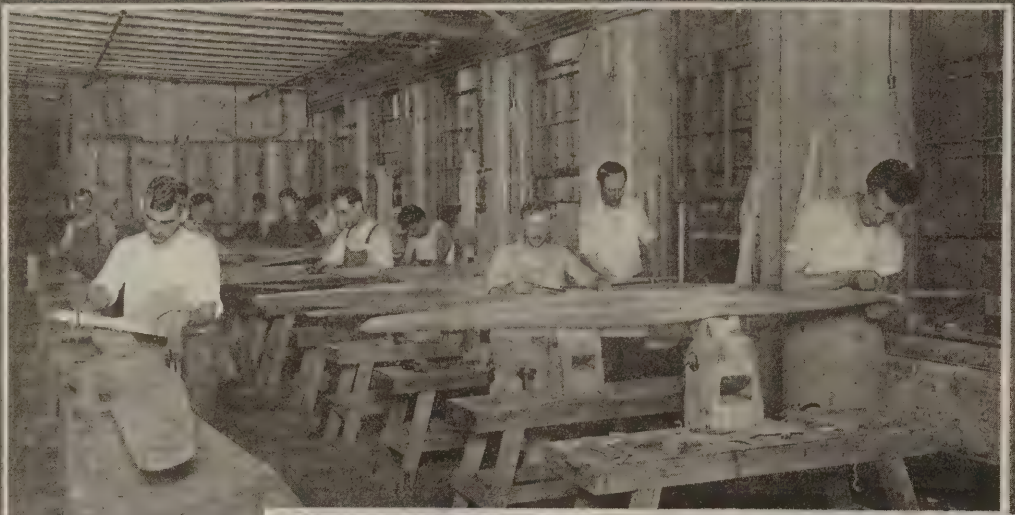
The balloon is tied down to the bed and weighted with sandbags. In the foreground, in front of the bed, can be seen the compressed hydrogen tubes from which the balloon is filled with gas.

The Balloon bed is here shown built on slightly sloping ground, as it should be, the better to provide for drainage.

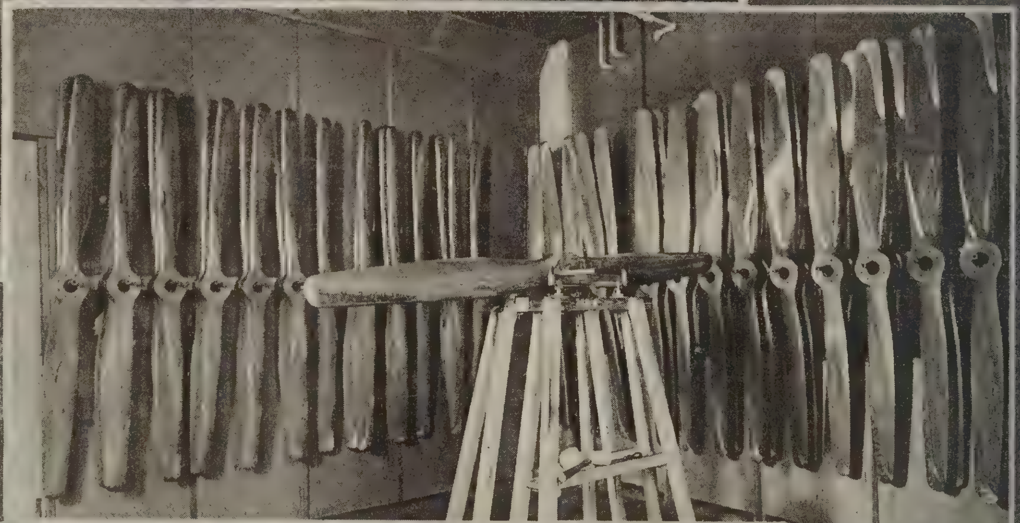
(To be continued)



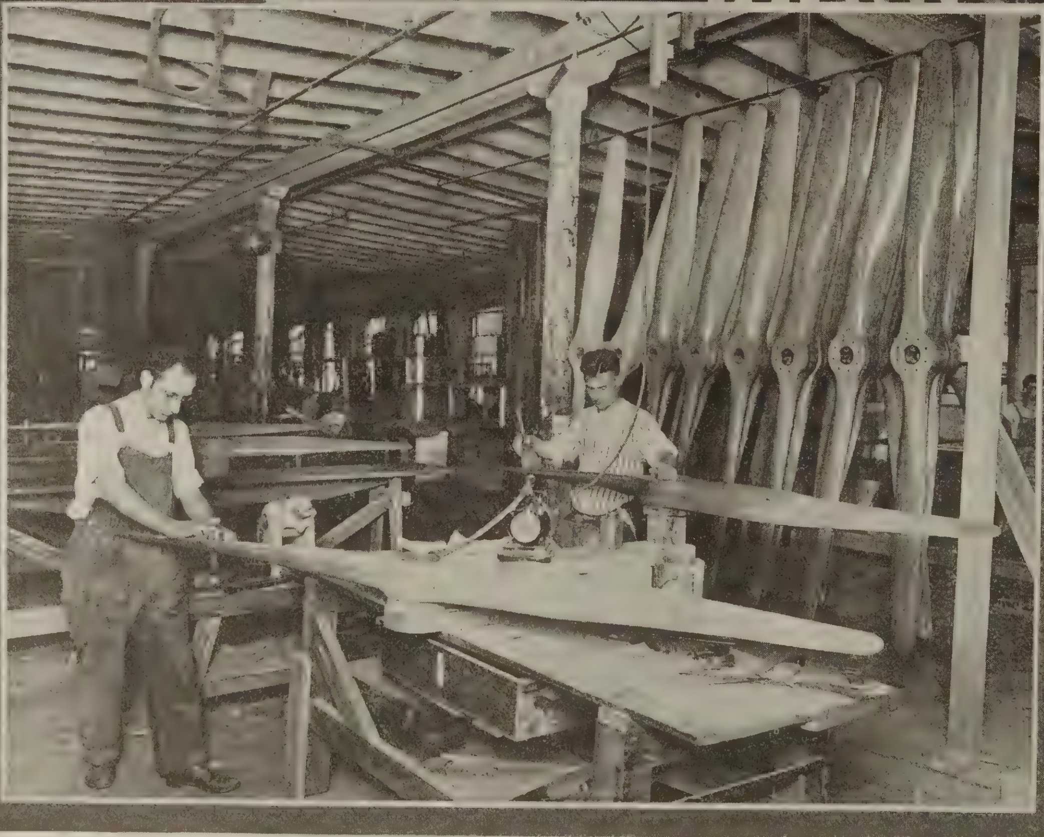
The Holbrook Company Factory



Hand surfacing and finishing propellers after all machine operations have been made. Templets are constantly applied to insure accuracy of pitch



Final inspection for balance — ready for shipment



Grinding blade ends to accommodate brass or copper protective tips

On the right applying first coat of varnish

Interior views of the Holbrook Company propeller department

CHARACTERISTICS OF THE AERIAL PROPELLER

By S. E. SLOCUM, Ph.D.

Professor of Applied Mechanics, University of Cincinnati, Member S. A. E.

PREVIOUS to the advent of the aeroplane, years of experiment with the marine propeller had proved that it was difficult to determine theoretically the elements of propeller action. In marine practice the chief reliance was on experiment and, in the course of time, sufficient experimental data was accumulated to serve as a basis for design. When it became necessary to design an aerial propeller, however, it was found that the action of a propeller in air was very different from that in water, and it was therefore necessary to begin experimenting all over again.

Typical experiments on the aerial propeller have been carried out by M. Eiffel in his laboratory at Auteuil, the results of which appear in his work on "Resistance of the Air and Aviation." Eiffel, however, made no use of these results other than to present them graphically by plotting. The object of this paper is to study these results more carefully and to derive from them by the method of Least Squares a formula which shall represent the characteristics of the aerial propeller.

For the purpose of Eiffel's experiments two propellers were constructed by M. Drzewiecki, one, full size, 2.715 m. in diameter, and the other its one-third size model, 0.905 m. in diameter. The full size propeller was tested by Captain Dorand at Chalais, and the model by M. Eiffel in his laboratory at Auteuil. The propeller of M. Drzewiecki was a screw with a constant angle of incidence of 5 degrees, and a width of blade equal to one-sixth the radius.

In order to present the results of these experiments graphically, it is necessary to use as abscissa and ordinate certain combinations of the quantities involved. To indicate these quantities, let

V = velocity of translation of propeller relative to the air in meters per second,

n = speed of propeller in revolutions per second,

D = diameter of propeller in meters,

F = thrust of propeller in kilograms.

If the velocity of translation and the velocity of rotation at the tip of the blade are varied proportionally, the relative velocity of any point varies with them but remains unchanged in direction; that is to say, for a given direction of the relative velocity at the tip, the relative velocity at any point is fixed in direction and varies directly as V. For this reason Eiffel chose the ratio $\frac{V}{\pi nD}$ or $\frac{V}{nD}$ as abscissa in drawing the graph representing his experiments. For ordinate, however, Eiffel chose the combination $\frac{F}{N^2D^4}$; that is to say, he *assumed* that the thrust varied as the square of the speed and fourth power of the diameter. When his experimental data were plotted, however, this assumption was found to be incorrect, as it produced a series of parallel curves. From this result Eiffel concluded that "the reaction of the air upon a propeller cannot be assumed exactly proportional to the square of the relative velocity," but made no attempts to modify his assumptions to fit his experiments.

In what follows the combination $\frac{V}{nD}$ used by Eiffel as abscissa is retained, as the choice of the independent variable is not essential and this choice makes it possible to compare results with those obtained by Eiffel. Eiffel's assumption for the ordinate is not followed, however, but the proper combination is determined from Eiffel's experimental data by the method of Least Squares. The final result of this method will be found to fit the entire series of exceptional data determined both by Eiffel and Dorand with a surprising degree of accuracy.

The experimental data observed by Eiffel and Dorand are given in the left side of the following table. On the right side are tabulated certain quantities computed from these data, as explained in what follows.

EIFFEL'S EXPERIMENTS.

Revolutions		Velocity V	Thrust F	$\frac{V}{ND}$	$\frac{F}{N^{2.261} D^{4.254}}$
Per Min.	Per Sec.	meters,/sec.	Kilograms		
600	10	0	1.060	0	.0088863
942	15.7	0	2.660	0	.0080421
1260	21	0	5.290	0	.0082858
1600	26 2-3	0	9.850	0	.00898995
600	10	5.22	0.668	0.577	.0056000
942	15.7	5.44	2.390	0.384	.0072258
1260	21	5.66	4.870	0.298	.0076279
1600	26 2-3	6.30	8.550	0.262	.0078031
600	10	8.00	0.071	0.885	.00059521
942	15.7	8.10	1.695	0.571	.0051245
1260	21	8.39	4.090	0.443	.0064062
1600	26 2-3	8.72	7.650	0.362	.0069817
942	15.7	10.20	1.087	0.719	.0032864
1260	21	10.35	3.400	0.546	.0053255
1600	26 2-3	10.65	6.880	0.442	.0062790
942	15.7	12.57	0.268	0.886	.00081025
1260	21	12.68	2.530	0.668	.0039628
1600	26 2-3	13.00	5.800	0.539	.0052933
1260	21	15.07	1.510	0.794	.0023651
1600	26 2-3	15.35	4.940	0.637	.0045084
1260	21	17.32	0.376	0.913	.00058893
1600	26 2-3	17.53	3.510	0.727	.0032034
DORAND'S EXPERIMENTS.					
540	9	0	90.5	.0	.0089918
540	9	4.9	84.4	.2	.0083857
540	9	9.8	70.7	.4	.0070246
540	9	14.6	49.6	.6	.0049281

Since Eiffel's assumption that the thrust varies as the square of the speed proved to be incorrect, the first step is to determine the relation between thrust and speed. For this purpose make use of Eiffel's first set of four experiments, in which V is zero, and write the required relation in the form

$$F = Cn^aD^b \tag{1}$$

This is equivalent to determining the ordinate to the curve shown in Figure 1 corresponding to the abscissa $\frac{V}{nD} = O$.

Since Eiffel's experiments were all performed on the same propeller, D is constant, and we may therefore combine C and D in a single constant K, in which case we have

$$F = Kn^a, \tag{2}$$

in which a is the unknown quantity to be determined. Reducing this equation to the linear form by taking logarithms, it becomes

$$\log F = \log K + a \log n. \tag{3}$$

Substituting in this the values of F and n from the first four of Eiffel's experiments, we obtain the following set of four observation equations:

$$\left\{\begin{array}{l} .025306 = \log K + a \\ .424882 = \log K + 1.195900a \\ .723456 = \log K + 1.322219a \\ .993436 = \log K + 1.425969a \end{array}\right. \tag{4}$$

We have here four equations in two unknowns, namely log K and a. To obtain the most probable value of the unknowns from such a set of conditioned observation equations by the method of Least Squares, the process consists in reducing the set to as many normal equations as there are unknowns, which in this case is two. The normal equation for a is obtained by multiplying each observation equation by the coefficient of a in this equation and adding the results. Similarly the normal equation for log K is obtained by multiplying each observation equation by the coefficient of log K in this equation and adding the results. The resulting normal equations are as follows:

$$(5)\quad \begin{cases} \text{Normal equation for } \log K \\ 2.167080 = 4 \log K + 4.944088a, \\ \text{Normal equation for } a \\ 2.906599 = 4.944088 \log K + 6.211837. \end{cases}$$

Solving these two equations simultaneously for the two unknows, the result is

$$(6)\quad \begin{cases} a = 2.261, \\ \log K = -2.252876 = 7.747124 - 10, \\ \text{whence } K = .0055863. \end{cases}$$

The next step is to determine how the diameter of the propeller affects the thrust. The only experimental data available for this is to compare corresponding experiments made by Eiffel and Dorand. Since the model tested by Eiffel was built to one third the size of the propeller tested by Dorand, to develop similar characteristics the speed of the model should be three times that of the full size propeller. The following data from the two sets of experiments are therefore chosen for comparison:

EIFFEL	DORAND
$D = 0.905$ m.	$D = 2.715$ m
$F = 9.85$ kg.	$F = 90.5$ kg
$n = 1600$ r.p.m. $= 26\frac{2}{3}$ r.p.s.	$n = 540$ r.p.m. $= 9$ r.p.s.

Writing formula (1) in the form

$$(7)\quad \frac{F}{n^{2.261}} = CD^b$$

and substituting the above data, we obtain the two equations

$$(8)\quad \begin{cases} \dfrac{9.85}{(26\frac{2}{3})^{2.261}} = C\,(.905)^b \\[2ex] \dfrac{90.5}{9^{2.261}} = C\,(2.715)^b \end{cases}$$

Eliminating C and solving for b the result is

$$(9)\quad b = 4.254$$

To find the constant C we have from equations (1) and (2),

$$(10)\quad CD^b = K,$$

or, by taking logarithms,

$$\log C + b \log D = \log K,$$

in which $D = 0.905$ and, as already found, $b = 4.254$ and $\log K = 7.747124 - 10$.

Consequently

$$\log C = 7.931539 - 10$$

whence

$$(11)\quad C = .008542$$

For $V = O$, the required relation is therefore

$$(12)\quad F = .008542\, n^{2.261}\, D^{4.254}$$

A large two-blader for a dirigible

We may now proceed to determine the general expression for the thrust in terms of the relative velocity of the air with respect to the propeller. This is equivalent to finding the equation of a curve which best fits the observed data. The curve most suitable for this purpose is one represented by an algebraic equation of the form

$$y = C + P x + Q x^2 + R x^3 + \ldots$$

as many terms being taken as may prove to be necessary. In the present case, by plotting the observed data, it is found that the points so determined assume the form of a parabola. This suggests that the first three terms of the above expression will be sufficient, namely

$$y = C + P x + Q x^2.$$

As mentioned above, the quantity $\dfrac{V}{nD}$ represents the abscissa x, and the combination just determined, namely $\dfrac{F}{n^{2.261}\, D^{4.254}}$ the ordinate y. The equation of the required curve therefore takes the form

$$(13)\quad \frac{F}{n^{2.261}\, D^{4.254}} = C + P\left(\frac{V}{nD}\right) + Q\left(\frac{V}{nD}\right)^2$$

in which the coefficients C. P and Q are to be determined. The first coefficient C has already been determined, since for V = O we have found that

$$C = 0.008542$$

To determine P and Q substitute the experimental data observed by Eiffel and Dorand in Equation 13. The values of $\dfrac{V}{nD}$ and $\dfrac{F}{n^{2.261}\, D^{4.254}}$ have been calculated from these data and appear in the right hand side of Table 1. Substituting these calculated values we thus obtain the following set of twenty-one observation equations in the two unknowns P and Q:

OBSERVATION EQUATIONS

Observation equations based on Equation 13 written in the form

$$0 = \left(C - \frac{F}{n^{2.261}\, D^{4.254}}\right) + P\left(\frac{V}{nD}\right) + Q\left(\frac{V}{nD}\right)^2.$$

EIFFEL'S DATA

$$\begin{aligned}
0 &= .002942 + P\,(.577) + Q\,(.577)^2 \\
0 &= .001316 + P\,(.384) + Q\,(.384)^2 \\
0 &= .000914 + P\,(.298) + Q\,(.298)^2 \\
0 &= .000739 + P\,(.262) + Q\,(.262)^2
\end{aligned}$$

$$\begin{aligned}
0 &= .007947 + P\,(.885) + Q\,(.885)^2 \\
0 &= .003417 + P\,(.571) + Q\,(.571)^2 \\
0 &= .002136 + P\,(.443) + Q\,(.443)^2 \\
0 &= .001560 + P\,(.362) + Q\,(.362)^2
\end{aligned}$$

$$\begin{aligned}
0 &= .005256 + P\,(.719) + Q\,(.719)^2 \\
0 &= .003216 + P\,(.546) + Q\,(.546)^2 \\
0 &= .002263 + P\,(.442) + Q\,(.442)^2
\end{aligned}$$

$$\begin{aligned}
0 &= .007732 + P\,(.886) + Q\,(.886)^2 \\
0 &= .004579 + P\,(.668) + Q\,(.668)^2 \\
0 &= .003249 + P\,(.539) + Q\,(.539)^2
\end{aligned}$$

$$\begin{aligned}
0 &= .006177 + P\,(.794) + Q\,(.794)^2 \\
0 &= .004034 + P\,(.637) + Q\,(.637)^2
\end{aligned}$$

$$\begin{aligned}
0 &= .007953 + P\,(.913) + Q\,(.913)^2 \\
0 &= .005339 + P\,(.727) + Q\,(.727)^2
\end{aligned}$$

DORAND'S DATA

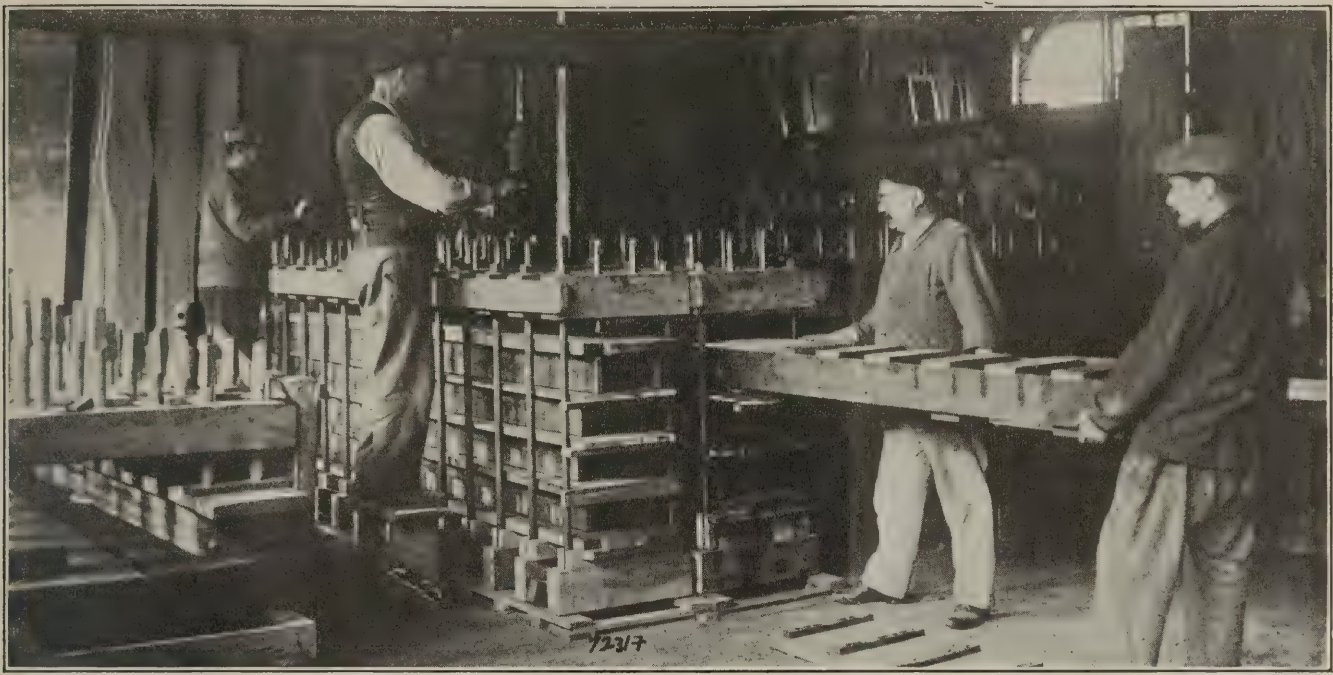
$$\begin{aligned}
0 &= .000156 + P\,(.2) + Q\,(.2)^2 \\
0 &= .001517 + P\,(.4) + Q\,(.4)^2 \\
0 &= .003614 + P\,(.6) + Q\,(.6)^2
\end{aligned}$$

To obtain the most probable values of P and Q from these equations, by the method of Least Squares, follow the same process used above for reducing them to a pair of normal equations. To obtain the normal equation for P multiply each equation through by the coefficient of P in this equation and add the results. Similarly, to obtain the normal equation for Q multiply each equation through by the coefficient of Q in this equation and add the results. The two normal equations derived in this way are then as follows:—

$$(14)\quad \begin{cases} 0 = .0526032 + 7.564893\,P + 5.2702055\,Q, \\ 0 = .038974455 + 5.2702055\,P + 3.9077221\,Q. \end{cases}$$

Solving these simultaneously for P and Q the results are

$$(15)\quad \begin{cases} P = -.00009015 \\ Q = -.00985184 \end{cases}$$



Here is shown the wood for the propellers being steamed. All wood used in their manufacture is placed in the boxes shown above and steamed in this apparatus. This is done to avoid warping

The required formula, representing a parabola adjusted as above to fit the observed data, is then as follows:—

$$\frac{F}{n^{2.261}\,D^{4.254}} = .008542 - .00009015\left(\frac{V}{nD}\right) - .00985184\left(\frac{V}{nD}\right)^2. \tag{16}$$

Plotting this equation, we have the curve shown in Figure 1. Plotting on the same sheet the observed data of Eiffel and Dorand, it is apparent that this parabola fits the data with exceptional closeness. In place of Eiffel's series of curves drawn separately for each value of *nD*, we have thus obtained a single relation which holds for all values of *n* and *D*.

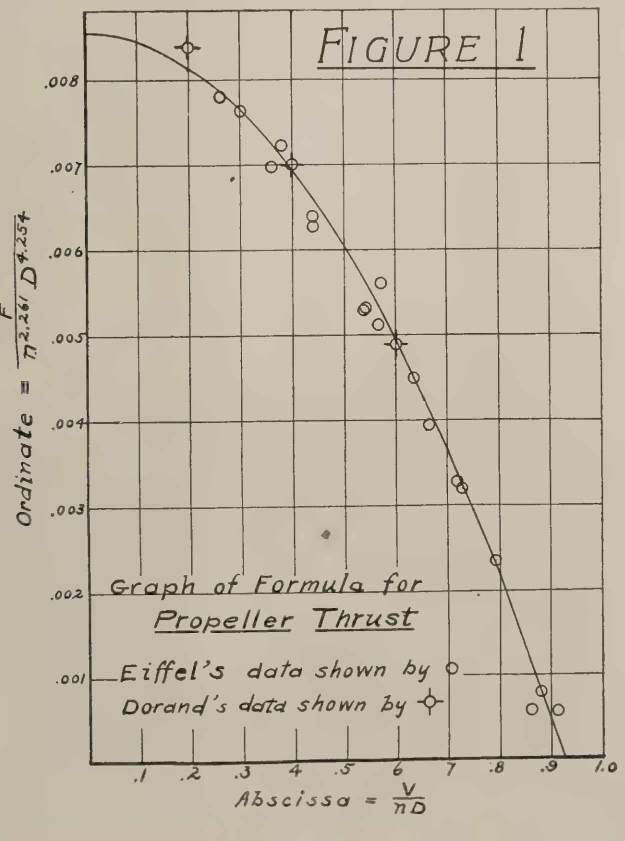


FIGURE 1

Since the coefficient *P* of the middle term is so small in comparison with the other two cofficients *C* and *Q*, it naturally suggests that this linear term may be omitted from the equation of the parabola without materially affecting the shape of the curve. To try the effect of omitting the middle term, return to the set of 21 observation equations and omit the term containing *P* in each. Then forming the normal equation for *Q* from this set in the usual way, the result is

$$0 = .038974455 + 3.9077221\,Q$$

whence

$$Q = -.0099734$$

or with sufficient exactness

$$Q = -.01.$$

The simplified equation of the curve therefore becomes

$$\frac{F}{n^{2.261}\,D^{4.254}} = .008542 - .01\left(\frac{V}{nD}\right)^2. \tag{17}$$

Plotting this parabola on the same sheet with that given by equation (16) as represented in Figure 1, it is found that the two curves are practically coincident, the ordinates for $\frac{V}{nD} = .7$ being identical, and the maximum difference in ordinates being less than two-tenths of one per cent.

Converting this formula from metric into English units by expressing

V in feet per second,
D in feet,
F in pounds,
n in revolutions per second,

the resulting equation in English units is

$$\frac{F}{n^{2.261}\,D^{4.254}} = .00012 - .00014\left(\frac{V}{nD}\right)^2. \tag{18}$$

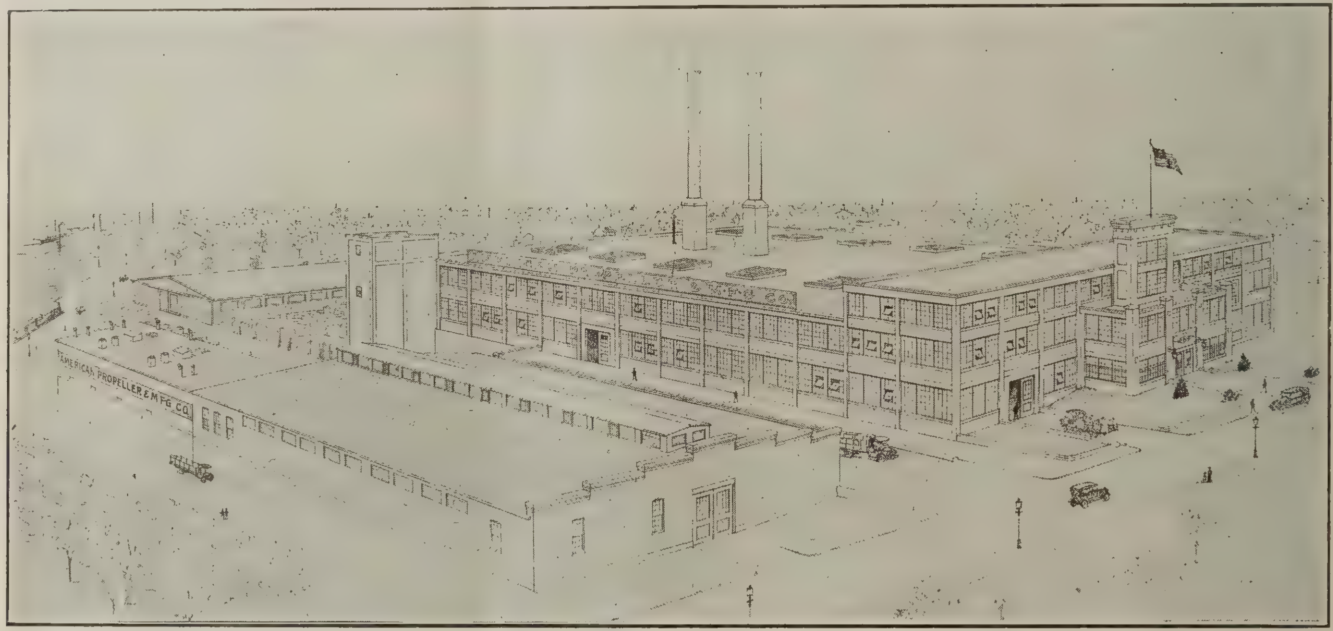
Finally, this formula may be simplified somewhat for practical calculations by writing it in the form

$$F = \frac{n^{2.261}\,D^{4.254}}{50{,}000}\left[6 - 7\left(\frac{V}{nD}\right)^2\right] \tag{19}$$

In a subsequent article the writer will present the corresponding formulas for propeller torque and for brake-horsepower.

THE AMERICAN PROPELLER & MANUFACTURING CO.'S NEW PLANT

The original factory of the American Propeller & Manufacturing Company


AMERICAN PROPELLER & MFG. CO.

The new factory of the American Propeller & Manufacturing Company

THE American Propeller & Manufacturing Company of Baltimore has just completed the erection of a new factory which will enable this pioneer firm to maintain its position as the largest maker of airscrews in America.

The new plant, designated as plant Number Four, is a modern three-story structure occupying two acres of ground and contains 95,000 square feet of floor space. It has a capacity of 300 combat or 500 training plane propellers daily. Plants numbers 1, 2 and 3 can produce 90 combat propellers or 150 training propellers daily. The plan is to devote these original plants to the production of training propellers and experimental work, concentrating on the production of combat and large lane propellers at the new plant. The new building is especially designed for propeller manufacture in quantities and is planned to execute the work to the greatest advantage.

The basement contains the power and electric plant and the dry kilns. Here all the lay-out work, rough moulding, joining, assembling, gluing, and drying is done. All machine operations are executed on the first floor.

The second floor is devoted to the surfacing and metal tipping department, while the third floor is devoted to the varnishing and final inspection.

An outstanding feature of the new plant is the ingenious machinery which was designed by Mr. Spencer Heath, the president of the company, particularly the duplicating machine, which does the work of three ordinary lathes, and the special instrument which accurately determines the pitch of the propellers without the use of templets.

With the addition of this new factory, the American Propeller Company has four plants in Baltimore with a total floor space of 158,000 feet and dry kiln capacity of 350,000 feet B. M., and employs 1,200 people. This, unquestionably, makes this firm the largest exclusive manufacturer of propellers in America and its remarkable growth parallels the expansion of the aeronautic industry in America.

The firm was established in 1909 in Washington by Mr. Spencer Heath, and in 1912 moved to Baltimore. At this time Mr. J. M. Creamer joined Mr. Heath as the Vice-President and General Manager of the institution.

Up until the beginning of the war this firm was purely an engineering proposition and the manufacture was limtied to custom made work to suit the individual requirements of each plane. This firm has probably made more propellers for experimental work than any other manufacturer of propellers.

Primarily, its mission is to solve the engineering problems of aircraft propulsion, and the practical knowledge of this important part of the aeroplane has enabled this firm to prove of valuable assistance to the Allies as well as to America.

The machine shop of the American Propeller & Manufacturing Company

NOTES ON AIRSCREW ANALYSIS

By M. A. S. RIACH, A. F. Ae. S., Assoc. Inst. N. A.

THE present investigation is the outcome of an attempt to modify the existing theory of the airscrew so as to more correctly represent the conditions under which an airscrew may be supposed to be working, and to thereby more closely co-ordinate theory with experiment. The most complete working theory of the subject yet evolved is probably the one outlined in the writer's paper "The Screw Propeller in Air," * and further developed with modifications in "The Screw Propeller with Race Rotation," published in AERONAUTICS of last year.† Both these papers depend for their basis upon wind-channel tests on aerofoil sections. In the theory so far developed, certain assumptions have had to be made, and the particular nature of those finally adopted leads to certain results which can be compared with experimental tests. Conversely, if the experimental results are found to differ materially from those given by the theory, then obviously it would become necessary, if possible, to modify the basic conceptions underlying the analytical treatment of the subject. Such experimental tests must of necessity, however, be very accurately carried out, and also of a sufficient number to exclude as far as possible the possibility of serious errors in the work. Before, however, attempting to make any comparisons between experiment and theory, it is convenient to analyse the changes likely to be brought about by variation in one or more of the parameters involved in the hypothesis upon which the theory is based.

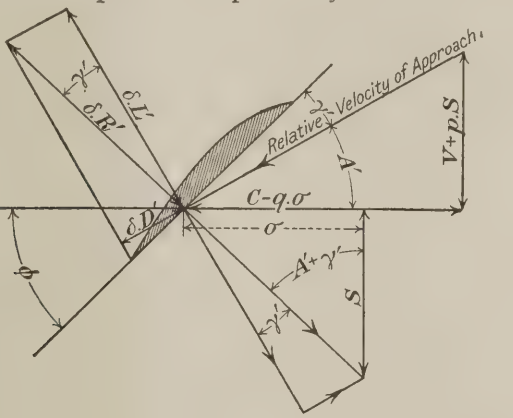


FIG. 1

Three main assumptions have been made in the treatment as it has so far been developed :

(1) The flow of air over the blade is everywhere assumed to be two-dimensional.

(2) The ratio of the inflow velocity (axial and transverse) immediately in front of any blade element to the slip velocity (axial and transverse) at the same radius has been taken to be equal to one half. This is rigorously true if it be assumed that the energy in the wake is numerically equal to the work done in acquiring the total slip velocities both axial and transverse.

(3) The whole of the ring annulus at all radii is assumed to be operative in producing thrust, or, more correctly, in measuring the mass of fluid passing per second. Thus the coefficient has a value of unity.

In the present investigation, (1) will be assumed to be true, but (2) and (3) will be made to vary

We commence by variation of (2) only.

With the previous notation let $(V+p.S)$ be the relative air speed axially at the blade element, and $(C-q.\sigma)$ the transverse relative air speed, where p and q are substituted for $\frac{1}{2}$ as given previously.

Then we have at once :

$$\tan A'=\frac{V+p.S}{C-q.\sigma}, \text{ and } \frac{V}{C}=\tan A$$

giving

$$\sigma=\frac{C.[\tan A'-\tan A]-p.S}{q.\tan A'} \qquad (1)$$

Again consider Fig. 1.

Let A' be the angle of the relative wind, having components $(V+p.S)$ axially and $(C-q.\sigma)$ transversely, then the resultant force $\delta R'$ on the blade element must lie at an angle of $(90^\circ+\gamma')$ to the relative wind, γ' being the gliding angle of the blade section. Hence the corresponding direction of the *total* slip velocity (axial and transverse) must be inclined at an angle of $90^\circ-(A'+\gamma')$ to the plane of rotation, having components of velocity denoted by S and σ respectively. It is then evident from the figure that

$$\frac{\sigma}{S}=\tan(A'+\gamma') \text{ which is independent of } p \text{ and } q.$$

Hence

$$\sigma=S.\tan(A'+\gamma') \qquad (2)$$

eliminating σ from (1), we get :

$$\frac{C.[\tan A'-\tan A]-p.S}{q.\tan A'}=S.\tan(A'+\gamma')$$

i.e.,

$$S=\frac{C.(\tan A'-\tan A)}{p+q.\tan A'.\tan(A'+\gamma')} \qquad (3)$$

giving the value of the total axial slip S in terms of p and q. If $p=q=\cdot 5$, S reduces to the original formula given in "The Screw Propeller with Race Rotation."

Now the axial thrust on any blade element is given by :

$$dT'=\frac{cy'.\rho.b.dx.(V+p.S)^2.\cos A'.(1-\tan A'.\tan\gamma')}{\sin^2 A'} \qquad (4)$$

under the new hypothesis,

and the mass of air passing through any annular ring element along the propeller blade may be written :

$$dM'=f.\rho.2\pi x.dx.(V+p.S) \qquad (5)$$

where f is a coefficient having a maximum possible value of unity.

Hence thrust per annulus $=dM'.S$

and ∴ ,, blade $=\frac{dM'.S}{N}$, with N blades.

whence equating this to (4), we get :

$$cy'=\frac{f.2\pi x.S.\sin^2 A'}{N.b.(V+p.S).\cos A'.(1-\tan A'.\tan\gamma')}$$

or, substituting for S from (3), we obtain :

$$cy'=\frac{f.2\pi x.\sin A'.(\tan A'-\tan A)}{N.b.(1-\tan A'.\tan\gamma').[p+q.\tan A.\tan(A'+\gamma')]} \qquad (6)$$

Now it is at once evident that a variation of either p or q between the possible limits zero and unity will only produce comparatively small changes in the function cy', excluding, of course, such values of either p or q which make cy' infinite.

Turning, then, to the second possible variant—namely (3), we may consider the changes in the value of cy' brought about by variation of f, the coefficient of the annular ring element at radius x. It is probably sufficiently accurate for this purpose to assume that f retains its value for all radii.

An investigation on these lines, combined with experimental results, reveals the fact that f cannot remain constant for all values of V, and must be, in fact, a function both of V and S—*i.e.*, of A', and this naturally leads us to a new hypothesis.

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* Read before the Aeronautical Society, March 1917

† *The Screw Propeller with Race Rotation*, AERONAUTICS, September 19, 1917

A New Hypothesis

It would appear that however we may regard the problem, the only real unknown is the exact quantity of fluid that may be supposed to pass through the annualar ring element per second. We started by assuming that either the whole of the ring element was employed to produce thrust, or that the amount could be represented by some constant fraction (f). There is, however, another method of estimating, and it is this new process that will now be described. Consider an element of blade at a radius of x and at an angle of φ to the plane of rotation, Fig. 2.

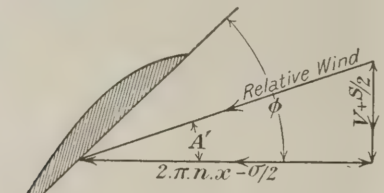


FIG. 2

Then the relative wind speed striking the element of blade has a value of $(V+S/2).\text{cosec}\,A'$, and an inclination of A' to the plane of rotation. It is further fairly obvious that the air affected by the presence of the blade element extends to a great distance above and below the section in a direction normal to the direction of the relative wind. As, however, the amount of such variation is unknown, *a priori* it is at least legitimate to substitute for such an extended field a finite layer which may then be considered as possessing a uniform deflection and velocity which is the equivalent of the more correct strata of influence. This distance we will call the "gap" of the section, and its value may be denoted by the symbol Ω. Having now defined the new premises, it is an easy matter to estimate the amount of fluid passing the section per second. The mass of fluid affected per second by the blade element will be therefore:

$$\rho.\Omega.dx.(V+S/2).\text{cosec}\,A'$$

for *each* blade, and hence the total for the airscrew having N blades:

$$\rho.N.\Omega.dx.(V+S/2).\text{cosec}\,A' \text{ instead of}$$
$$\rho.f.2\,\pi x.dx.(V+S/2),$$

so that now (f) must have the value of:

$$f=\frac{N.\Omega.\text{cosec}\,A'}{2.\pi.x},$$

i.e., f is now a function of A', and hence of V and S.

Now the distance between any two consecutive blade paths may be easily shown to be equal to:

$$\frac{\sin A'.(2\pi nx-\sigma/2)}{N.n}=\frac{\sin A'.}{N}\left[2.\pi.x-\frac{\sigma}{2.n}\right]$$

and hence Ω should not exceed this value, although there is probably a very sensible interference between the blades for a much smaller value than this, possibly, indeed, for *all* values, and increasing with increase of the ratio:

$$\frac{\Omega.N}{\sin A'.\left[2\pi x-\frac{\sigma}{2.n}\right]}$$

So far the hypothesis has been kept comparatively general, but it will be necessary to introduce a further modification connecting Ω with the blade width (b). For the present we shall regard the ratio $\left(\frac{\Omega}{b}\right)$ as a constant for all radii, as well as for all values of A', and possibly also for all types of airscrews.

The ratio $\left(\frac{\Omega}{b}\right)$ will be denoted by (μ), and the value of (μ) appears to be about 1 to 1·3—*i.e.*, the "equivalent stratum" of air affected by any blade element is approximately equal in *depth* to the blade width at that radius.

We now proceed to estimate the value of cy' as before:

axial thrust per annulus per blade

$$=\rho.\Omega.dx.(V+S/2).\text{cosec}\,A'.S$$

axial thrust per element per blade

$$=\frac{cy'.\rho.b.dx.(V+S/2)^2.\cos A'.(1-\tan A'.\tan\gamma')}{\sin^2 A'}$$

Hence equating these two expressions, we obtain:

$$cy'=\frac{\Omega.\tan A'.S}{b.(V+S/2).(1-\tan A'.\tan\gamma')}$$

But

$$S/2=\frac{2.\pi.n.x.(\tan A'-\tan A)}{1+\tan A'.\tan(A'+\gamma')}$$

and $\therefore$

$$V+S/2=2.\pi.n.x.\left[\tan A+\frac{\tan A'-\tan A}{1+\tan A'.\tan(A'+\gamma')}\right]$$
$$=2.\pi.n.x.\left[\frac{\tan A'.\{1+\tan A.\tan(A'+\gamma')\}}{1+\tan A'.\tan(A'+\gamma')}\right]$$

and $\therefore$

$$\frac{S}{V+S/2}=\frac{2.(\tan A'-\tan A)}{\tan A'.[1+\tan A.\tan(A'+\gamma')]}$$

and $\therefore$

$$cy'=\frac{2.\Omega.(\tan A'-\tan A)}{b.[1-\tan A'.\tan\gamma'+\tan A.\tan A'+\tan A.\tan\gamma']}$$

Now put

$$\tan\gamma'=\frac{cx'}{cy'}, \text{ and } \frac{\Omega}{b}=\mu,$$

and then we obtain finally:

$$cy'=(2.\mu+cx').\tan(A'-A)$$

which is the new expression for cy', which, if μ is constant, does not contain b the blade width. This means, therefore, that the angles of the blade φ are no longer influenced by blade width, and conversely that by increasing the blade width of an airscrew the thrust will be increased in the same proportion if $\frac{V}{n}$ is constant. It is well known, however, from model experiments that the thrust does not increase in the same proportion as the blade width, and this was accounted for on the previous theory by assuming that a larger inflow speed was obtained by increasing the blade width, thereby reducing the angle of attack α', and hence the thrust per unit area. It is by no means certain, however, that this loss of thrust must not be sought for in the mutual interfering action of one blade upon another, and not entirely, if at all, in the supposed augmentation of inflow velocity in front of the blade. It is evident that the new hypothesis outlined above represents the opposite extreme to the previous one employed. In the previous theory, *all* the air was supposed to be usefully employed in producing thrust, so that any further increase in thrust could only be obtained by supposing that the speed of inflow in front of the disc was increased, that is that such inflow was thus made to be dependent upon blade width. In the new theory the whole of the ring annulus is *not* necessarily taken to be employed, with the result that an increase in thrust does not entail an increase in inflow speed, but instead the employment of a larger percentage of the ring elements composing the airscrew disc—*i.e.*, a larger value of the coefficient f. It is probable that these two theories represent extremes, neither of which are fully realised in practice, and a more correct process would probably include to some extent a modification of both the hypotheses upon which they are respectively founded.

It should be noted, however, in passing that the value assigned to the coefficient μ does not uniquely determine the magnitude of the interference between the blades, the probability being that however large the ratio

$$\frac{\text{distance between consecutive blade paths}}{\text{blade width}}$$

there will be some sensible interfering action, which will become greater as this ratio is diminished with consequent loss of thrust per unit area. For the present, however, such refinements as those outlined above must of necessity be ignored in the analytical treatment of the subject, and the following analysis, whilst not being considered to be by any means complete, will at any rate serve to show the other side of the problem, and may possibly indicate the road by which a connection between the two extremes contemplated in the two hypotheses will eventually be established. Returning, then, to the analysis, we see immediately that the work is now in a much simpler form, and that the design of an airscrew by this method may be proceeded with at once without having to employ the tedious trial and error process of finding the blade width constant which was unavoidable in the previous theory. The formula established is given by :—

$$cy'=(2.\mu+cx').\tan(A'-A)$$

which for purposes of design, gives :

$$\tan A'=\frac{cy'+\tan A.(2.\mu+cx')}{2.\mu+cx'-cy'.\tan A}$$

and this may be more conveniently expressed by :

$$\tan A'=\tan(\theta+A)$$

i.e. $A'=\theta+A$,

where : $\tan\theta=\dfrac{cy'}{2.\mu+cx'}$.

This transformation is very convenient when finding approximate values of the thrust, torque, and efficiency. Consider first the efficiency of a blade element, expressed by :

$$\eta=\frac{\tan A}{\tan(A'+\gamma')}$$

and making the substitution ; $A'=A+\theta$, we obtain :

$$\eta=\frac{\tan A}{\tan(A+\theta+\gamma')}.$$

Now A is fixed by the $\frac{V}{n}$ value, since $A=\tan^{-1}\left(\frac{V}{2.\pi.n.x}\right)$ hence for a given $\frac{V}{n}$ value, at any radius x, A is constant, and therefore $(\theta+\gamma')$ must be a *minimum* for a maximum value of η.

Now $\theta+\gamma'=\tan^{-1}\left(\dfrac{cy'}{2.\mu+cx'}\right)+\tan^{-1}\left(\dfrac{cx'}{cy'}\right)$.

Hence this expression must be a minimum, and this will determine the best values of cy' and cx' to employ for any section along the blade, knowing the blade section. For blade sections having a thickness/chord ratio of about 0·08, the angle α' corresponding to a minimum value of $(\theta+\gamma')$ appears to lie between zero and -1 degrees. Hence we can write, since $(\theta+\gamma')$ is independent of A ;

$$\eta=\frac{\tan A}{\tan(A+\lambda)},$$

where λ=the *minimum value of* $(\theta+\gamma')$.

Regarding now A as the variable, it is at once evident that η is a *maximum*, when

$$A=\frac{\pi}{4}-\lambda/_2.\ \textit{i.e.},\ A=45-\lambda/_2 \text{ degrees.}$$

The maximum value of the efficiency at some point on the blade will then be :

$$\eta_{max}=\left[\frac{1-\tan\lambda/_2}{1+\tan\lambda/_2}\right]^2$$

This gives a value of about 78 per cent. efficiency for modern airscrew sections as tested at high speeds in the wind-channel. It is evident, therefore, that the remainder of the blade will be considerably *less efficient* than this value. This brings us naturally to the question whether airscrew sections having a purely two-dimensional flow at high speeds are not considerably more efficient than tests in a wind-channel on corresponding sections appear to show, where the air speed is much less and the total flow over the model wing varies very much from the purely two-dimensional flow contemplated in the airscrew theory.

We may now consider the total efficiency of an airscrew blade in the light of the foregoing theory.

The efficiency is given by :

$$\eta'=\frac{V}{2.\pi.n.}\cdot\frac{\displaystyle\int_{r_0}^{r}x^2.cy'.b.\sec A'.(1-\tan A'.\tan\gamma').\left[\frac{1+\tan A\ .\tan(A'+\gamma')}{1+\tan A'.\tan(A'+\gamma')}\right]^2.dx}{\displaystyle\int_{r_0}^{r}x^3.cy'.b.\sec A'.(\tan A'+\tan\gamma').\left[\frac{1+\tan A\ .\tan(A'+\gamma')}{1+\tan A'.\tan(A'+\gamma')}\right]^2.dx}$$

Now since $A'=\theta+A$, we can substitute in the above, and then :

$$\eta'=\frac{V}{2.\pi.n.}\cdot\frac{\displaystyle\int_{r_0}^{r}dx.x^2.cy'.b.\sec(\theta+A).[1-\tan\gamma'.\tan(\theta+A)]\left[\frac{1+\tan A.\tan(\theta+A+\gamma')}{1+\tan(\theta+A).\tan(\theta+A+\gamma')}\right]^2}{\displaystyle\int_{r_0}^{r}dx.x^3.cy'.b.\sec(\theta+A).[\tan\gamma'+\tan(\theta+A)]\left[\frac{1+\tan A.\tan(\theta+A+\gamma')}{1+\tan(\theta+A).\tan(\theta+A+\gamma')}\right]^2}$$

and we shall now regard cy' and cx' as constants, as well as θ, and then integrate over the blade.

This formula applies to any blade outline b or $c'.f(x)$, but a simplification can be introduced if the function $f(x)$ be made equal to the distance between consecutive blade paths. This form of blade outline may be called the "Rational" blade; it is similar to that described by Lieut. A. R. Low, R.N.V.R., and was employed by the writer in previous work on this subject.

The substitution for $f(x)$ is given by :

$$f(x)=\frac{\sin A'}{N.n}\cdot\left[2.\pi.n.x-\frac{\sigma}{2}\right]$$

i.e. $$f(x)=\frac{2.\pi.x.\sin A'}{N}\cdot\frac{(1+\tan A\ .\tan(A'+\gamma'))}{(1+\tan A'.\tan(A'+\gamma'))}$$

whence substituting in the expression for η', we obtain :

$$\eta'=\frac{V}{2.\pi.n.}\cdot\frac{\displaystyle\int_{o}^{D/_2}x^3.cy'.\tan A'.(1-\tan A'.\tan\gamma').\left[\frac{1+\tan A\ .\tan(A'+\gamma')}{1+\tan A'.\tan(A'+\gamma')}\right]^3.dx}{\displaystyle\int_{o}^{D/_2}x^4.cy'.\tan A'.(\tan A'+\tan\gamma').\left[\frac{1+\tan A\ .\tan(A'+\gamma')}{1+\tan A'.\tan(A'+\gamma')}\right]^3.dx}$$

and the substitution : $A'=A+\theta$, cy'=constant, cx'= constant, θ=constant, will then enable the above expression to be easily evaluated.

A curve of η' against Z is given in Fig. 3, for fairly representative values of cy' and cx', as an example of how the efficiency varies with variation in the $\left(\frac{V}{n.D}\right)$ ratio. A maximum value of η' appears from this curve to occur at a value of Z of about 2, the values of η' for $cx'=o$, forming an extreme case which in practice cannot be realised owing to the fact that cx' can never be zero. The lowest curve is taken from the ordinary wind-channel results on wing-sections, and is probably too low owing to the influence of aspect ratio already mentioned. Since the flow over

USHERING IN THE AGE O

The Flying Staff of the Aerial Mail Division. From left to right they are: Messrs. Harry L. Hartung, Second Assistant Postmaster-General Praeger, G. L. Conner, chief clerk to Mr. Praeger; E. Leroy Langley, Ed. V. Gardner, Captain B. B. Lipsner, Maurice A. Newton, Max Miller, Robert Shank. One hundred percent plus is the record maintained by the Aerial Mail aviators. The mail must go rain or shine—and the pilots are maintaining the best traditions and reputation of the Post Office Department.

Line Up of Aerial Mail Aeroplanes—Standards equip

AERIAL TRANSPORTATION

The Expert Mechanical Staff of the Aerial Mail Division. On the left is Mr. Conner, assistant to Second Assistant Postmaster Praeger; in the center, Captain Benjamin B. Lipsner, superintendent of Aerial Mail Division. The others are the expert mechanics, Henry Wacker, E. N. Angle, A. F. Cryder, Ed. C. Roll, Wm. C. Read, W. O. Beatty, Chas. King, A. C. Dannielle

with 150 h.p. Hispano-Suiza Motors, and postal aviators

airscrew sections is supposed to be purely two-dimensional in character $\left(\frac{cx'}{cy'}\right)$ will have *smaller* values than those obtained from the ordinary wing sections as tested in the wind-channel. To obtain more correct values of cy' and cx', it would be necessary to test an aerofoil of very high aspect ratio in the wind-channel, and obtain the values for the *mid-section* of the wing, where the flow may be taken as being two-dimensional only. A third curve is given in the figure which has been obtained by taking probable values for cy' and cx' when the flow is strictly two-dimensional. These curves then indicate how the "designed efficiency" of an airscrew may vary with variation of $\left(\frac{V}{n.D}\right)$. It is possible also that the value of μ may vary with variation of cy' and cx', the curves having been plotted for $\mu = 1{\cdot}2$. It should also be borne in mind that these curves apply only for a form of blade that *increases with increase in radius*, *i.e.*, that is widest at the blade tip; such a form is not generally employed in practice, and is probably not as efficient as one having a maximum blade width nearer the boss.

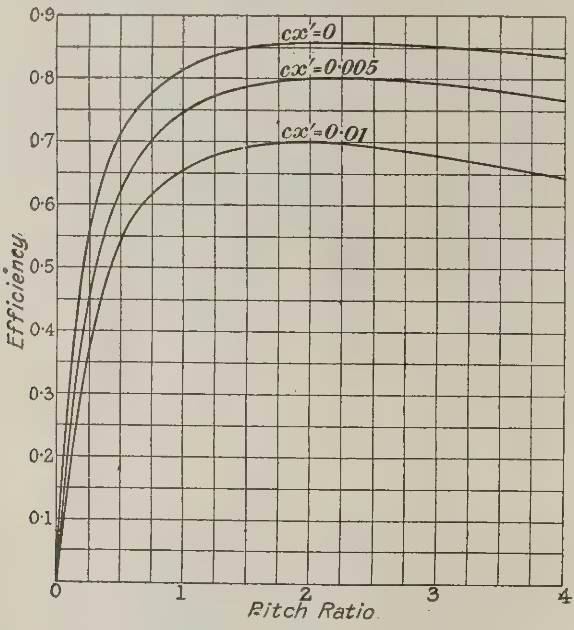


FIG. 3

The formula for efficiency from which these curves have been obtained is expressed by:

$$\eta' = \frac{Z.[12.E.Z^3 - 6.\pi.F.Z^2 + 4.\pi^2.G.Z + 3.\pi^3.J]}{\pi.[-6.J.Z^3 + 4.\pi.M.Z^2 + 3.\pi^2.F.Z + 4.\pi^3.E]}$$

where E, F, G, J, and M are coefficients depending upon the blade sections, and having values of respectively:

$$E = \tan\theta.(\tan\theta + \tan\gamma')$$
$$F = \tan\theta.(1 - \tan\gamma'.\tan\theta) + (1 - \tan^2\theta).(\tan\theta + \tan\gamma')$$
$$G = (1 - \tan^2\theta).(1 - \tan\gamma'.\tan\theta) - \tan\theta.(\tan\theta + \tan\gamma')$$
$$J = \tan\theta.(1 - \tan\gamma'.\tan\theta)$$
$$M = (1 - \tan\gamma'.\tan\theta).(1 - \tan^2\theta) + \tan\theta.(\tan\theta + \tan\gamma')$$

The formula for η' is obtained by integration of the formula already given, and variation of η' with the blade section coefficients must be obtained by variation of the values of the coefficients given above.

We can in the same way obtain an approximate formula for the thrust delivered by a helicopter of constant blade width, and this should form a good check upon the assumptions underlying the theory, since the conditions are then varied to an extreme degree. The results given by the theory for this case appear to agree quite well with experiment, thus confirming to some extent the new hypothesis. The two formulæ obtained for the helicopter are as follows:

$$\frac{W}{H} = \frac{4{,}400.\mu.cy'}{3.\pi.n.D.[(2.\mu + cx').cx' + cy_1^2]}$$

or eliminating n by means of the H.P. equation:

$$H = \frac{({\cdot}0121).W^{3/2}}{\mu^{\frac{5}{2}}.cy_1^{\frac{3}{2}}.N^{\frac{1}{2}}.b^{\frac{1}{2}}.D^{\frac{1}{2}}}.\psi$$

where

$$\psi = [(2{\cdot}\mu + cx').cx' + cy_1^2].[(2{\cdot}\mu + cx')^2 + cy_1^2]^{3/4}$$

and ψ will then have a *minimum-value* for some value of cy' and cx'. Taking $y = 1{\cdot}2$, and putting

$$\lambda = \frac{N.b}{D} = \frac{\text{Total blade width}}{\text{Diameter}}$$

we obtain:

$$W = H^{\frac{2}{3}}.D^{\frac{2}{3}}.\lambda^{\frac{1}{3}}.(25{\cdot}7).\psi^{-\frac{2}{3}}$$

which is of the usual form.

For an Eiffel No. 56 section, ψ had a minimum value of $4{\cdot}45$, giving an angle (φ) to the plane of rotation of about $10\frac{1}{2}$ degrees, and an angle of attack (α') of about 4 degrees.

The necessary revolutions for any given case can be obtained at once from the formula containing (n).

Recapitulating, the process of designing any given airscrew is therefore as follows:

1 Determine test values of α' for each section along the blade, knowing for which value in each case $\theta + \gamma'$ is a minimum. This will usually occur between -2 and zero degrees. This fixes the values of cy' and cx' to be employed in the design.

2 Choose the forward speed V—*i.e.*, the "top speed" or otherwise, and knowing the revolutions of the motor (n), A is known, since $\tan A = \frac{V}{2.\pi.n.x}$, for any radius ($x$).

3 Determine the A' values along the blade from the formula:

$$cy' = (2.\mu + cx').\tan(A' - A)$$

or

$$\tan A' = \frac{cy' + \tan A.(2.\mu + cx')}{2.\mu + cx' - cy'.\tan A}$$

taking a value of $\mu = 1{\cdot}2$ or otherwise as determined from experiment.

4 To each A' value add the corresponding α' value for the radius considered, obtained from (1) above.

5 Knowing $f(n)$ the blade width outline curve, plot the integral curve:

$$y = x^3.cy'.f(x).\sec A'.(\tan A' + \tan\gamma').\left[\frac{1 + \tan A\ .\tan(A' + \gamma')}{1 + \tan A'.\tan(A' + \gamma')}\right]^2.dx$$

for each value of x chosen, and then integrate into the planimeter between the limits r_0 and r.

6 Knowing the value of the torque integral from (5) in the correct units, the blade width constant (C') is given by:

$$C' = \frac{550.H}{8.\pi^3.n^3.N.\rho.\ \text{Area of integral curve}}$$

Then the true blade widths at each radius (x) will be:

$$b = c'.f(x).$$

An estimate of the probable value of the "correction factor," employed in the theory which ignores inflow and slip altogether, may be made from the formula:

$$\frac{1}{f} = \frac{C'}{c} = \frac{\int_{r_0}^{r} x^3.f(n).cy.\sec A.(\tan A + \tan\gamma).dx}{\int_{r_0}^{r} x^3.f(x).cy'.\sec A'.(\tan A' + \tan\gamma')\left[\frac{1 + \tan A\ .\tan(A' + \gamma')}{1 + \tan A'.\tan(A' + \gamma')}\right]^2.dx}$$

In a particular case for a two-bladed propeller of constant blade width of 8 feet diameter rotating at 1,400 revolutions per minute, and having a forward speed of 63 miles per hour, the value of $\frac{1}{f}$ was found to be equal to $\frac{100}{67}$. This particular propeller over-revd as might be supposed. This formula merely serves as a check upon the assumptions upon which this new hypothesis is based, and it was employed for the same purpose in the writer's former paper, "The Screw Propeller in Air."

There is one very characteristic point of dissimilarity between the present method and all the previous theories—namely the question of the best angle of attack to employ for maximum efficiency. By all the previous hypotheses, this angle should be that corresponding to a maximum value of the Lift/Drag ratio of the section considered, which means that the angle has a value between 2° and 4°. In the present theory, however, this is by no means true, the angle of attack for best efficiency being that corresponding to a *minimum* value of the function

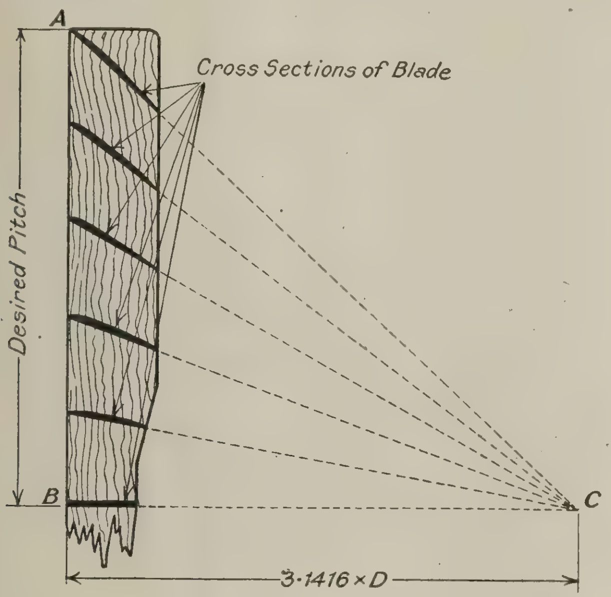
$$\tan^{-1}\left(\frac{cy'}{2.y+cx'}\right)+\tan^{-1}\left(\frac{cx'}{cy'}\right)$$

It will be noticed that the second term contains the criterion for maximum efficiency given by the other theories, the addition on this new hypothesis of the other term substantially modifying the values at which this minimum occurs.

THE PITCH OF AN AIRSCREW

By F. J. CAMM

ONE of the chief difficulties confronted by the aeromodellist lies in the design of the screw. This is practically the most important component of the whole machine, since excellence of work and design with regard to the other components are rendered void if the means of transmitting the power into work are inefficient. Fig. 1 shows the method of setting out the angles along the blade of a screw—the same method applies both for full size and model practice. First a line is laid off to any convenient scale, equal in length to the perimeter of the disc swept by the propeller during revolution. Another line is now laid off at right angles to the former, and, to the same scale, a distance equal to the desired pitch, and a triangle is thus constructed. Now divide up the line A B into any number of equidistant parts and connect these to the angle C, as shown; three points, however, are usually sufficient for propellers up to 12 inch diameter. These angles correspond to the angle required at the various points along the blade. For convenience a sketch of the propeller blade is included in the sketch and the cross sections at the same points shown.



By pure trigonometry, therefore, knowing pitch and diameter, or any two other factors, it is possible to obtain the third.

The table, which is reproduced from an early chapter to avoid cross reference, shows the pitches of screws for various diameters and pitch angles, calculated from the formula:—

$$P = \pi \text{ d } \tan A$$

where P = pitch

$\pi = 3·1416$

d = diameter

tan A = constant of the angle = tangent of tip angle.

TABLE OF PITCHES OF AEROPLANE PROPELLERS

Diam.	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	40°	42°	44°	45°
6"	1·98	2·65	3·32	4·01	4·7	5·41	6·13	6·86	7·62	8·39	9·19	10·02	10·89	11·78	12·72	13·70	14·73	15·82	16·97	18·21	18·85
7"	2·31	3·09	3·88	4·68	5·48	6·31	7·15	8·01	8·89	9·19	10·73	11·69	12·70	13·74	14·83	15·98	17·18	18·46	19·80	21·24	21·99
7·5"	2·48	3·31	4·16	5·01	5·87	6·76	7·66	8·58	9·52	10·49	11·49	12·53	13·61	14·73	15·89	17·12	18·41	19·77	21·22	22·76	23·57
8"	2·64	3·53	4·33	5·34	6·27	7·11	8·17	9·15	10·15	11·19	12·26	13·36	14·51	15·71	16·95	18·26	19·64	21·09	22·62	24·27	25·14
8·5"	2·81	3·75	4·71	5·68	6·66	7·66	8·68	9·72	10·79	11·89	13·03	14·20	15·42	16·69	18·01	19·40	20·87	22·41	24·05	25·79	26·71
9"	2·97	3·97	4·99	6·01	7·05	8·88	9·19	10·29	11·42	12·59	13·79	15·04	16·33	17·67	19·07	20·54	22·09	23·73	25·46	27·31	28·28
9·5"	3·12	4·19	5·26	6·35	7·44	8·56	9·70	10·87	12·05	13·29	14·56	15·93	17·23	18·65	20·13	21·69	23·32	25·14	26·88	28·83	29·85
10"	3·30	4·41	5·54	6·68	7·83	9·01	10·21	11·43	12·69	13·99	15·32	16·71	18·14	19·64	21·19	22·96	24·55	26·37	28·29	30·34	31·42
10·5"	3·47	4·64	5·82	7·01	8·22	9·46	10·72	12·01	13·32	14·69	16·09	17·54	19·05	20·62	22·25	23·97	25·78	27·68	29·70	31·86	32·99
11"	3·63	4·86	6·09	7·35	8·62	9·91	11·23	12·58	13·96	15·39	16·86	18·38	19·96	21·60	23·31	25·11	27·02	29·00	31·12	33·38	34·56
11·5'	3·80	5·08	6·37	7·68	9·01	10·36	11·74	13·15	14·60	16·09	17·62	19·21	20·86	22·58	24·37	26·25	28·23	30·32	32·53	34·89	36·13
12"	3·96	5·20	6·65	8·02	9·40	10·81	12·25	13·72	15·23	17·16	18·39	20·05	21·77	23·56	25·43	27·39	29·46	31·63	33·95	36·41	37·70

ANOTHER GRUMBLE ABOUT GLUE

By Dr. W. R. DRUSHEL, Recently of Kent School at Yale, Now in charge of the Chemical Research Division of the Haskelite Manufacturing Corporation, Grand Rapids, Michigan

IN a recent issue of the Aerial Age the author of the article on "A Grumble About Glue" has opened for discussion a vital question closely related to the production of aircraft. It is pretty well agreed that the proper material for a very considerable part of an aeroplane or hydro-aeroplane is wood in laminated form. With the rapid exhaustion of timber suitable for making solid wood parts the importance of laminated or plywood becomes increasingly great.

To make plywood obviously some suitable form of cementing material, or glue, is essential. Certain qualities in the cementing material are, of course, necessary and others are highly desirable. A glue should have adhesiveness in a high degree, the degree depending to some extent upon the use to which the plywood is put. A glue should not deteriorate through bacterial action, nor through vibration in use. For much of the aircraft work a glue should be water-resistant. Specifications for a glue which met the requirements of cabinetmakers a few years ago are wholly inadequate for aircraft work. A glue which may be admirably suited for making furniture may be wholly unfit for use in aircraft production due to the vastly different uses and degrees of exposure of the finished products.

Progress is being made in the development of glues which will meet the requirements of the more severe tests of aircraft work. This, however, does not excuse the use of glues which are obviously not intended to meet the more severe requirements in aeroplane work, and specifications should carefully differentiate between glues which are satisfactory adsives in the absence of moisture and those which retain their adhesiveness in a high degree when the plywood is water saturated.

It is well known that certain grades of cabinetmaker's glue which are satisfactory in the moderately dry climate of the west and middle west are wholly unsuited for use on a product to be used in the humid climate of the Atlantic seaboard. If it is commercially important to select cabinetmaker's glue to withstand the climate of the Atlantic seaboard, how much more important is it to use a highly water-resistant glue in the production of aircraft which is certain to be exposed to all kinds of weather conditions? In order that a plywood may be classed as water-resistant or water-proof it should not merely fail to fall apart when in a water saturated condition, but the glue should be of such a quality that it still retains a very large per cent of its adhesiveness in the water saturated condition of the plywood. Why should a glue be called water-proof or water-resistant if its adhesiveness in water-soaked panels falls to ten or twenty per cent of its strength in the dry state? Is it not becoming of vital importance to ascertain the strength of so-called water-proof glues under the most severe weather conditions? If a glue is to be used in Naval aircraft work especially is it not highly essential that it should be really water-resistant? There are on the market today glues advertised to be absolutely water-proof which in the water saturated condition have only a very small per cent of the adhesive strength which they posses in the dry condition. Is it fair to call such a glue water-proof or water-resistant? It is commonly assumed that a glue is sufficiently strong for plywood if the wood fibre is torn away when the plies are pulled apart. If this is an acceptable test for any glue in a dry panel, why should a water-proof glue not be put to a similar test in a water-soaked panel? If a shearing test is set for the glue in a dry panel, why should there not be a shearing test specified for a water-proof glue in a water-saturated panel in order to ascertain if the glue is really entitled to be called water-proof?

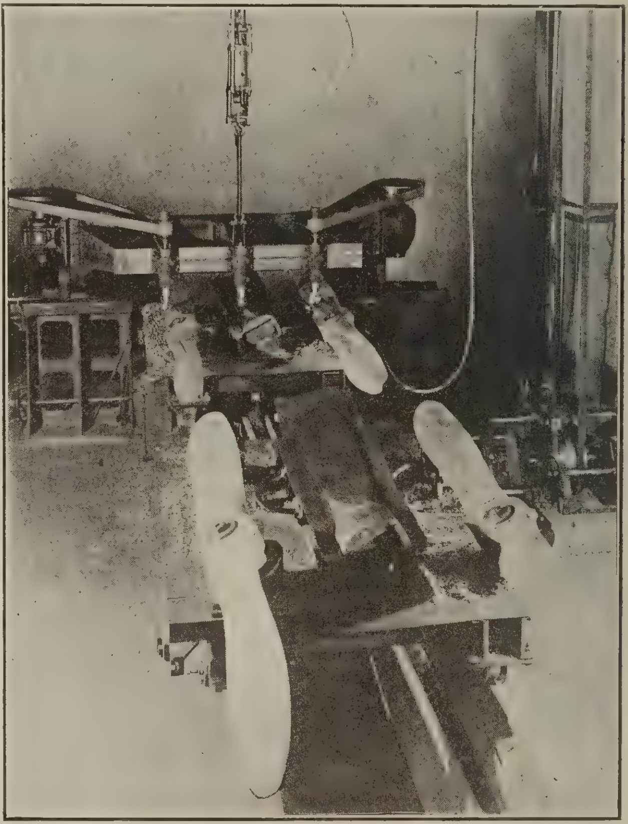
Suppose a glue said to be water-proof should dissolve to the extent of 30 per cent of its weight when soaked in water for a day, and suppose further that the water extract should prove to contain the adhesive qualities of the glue while the water insoluble residue should be correspondingly poor in adhesive properties, should such a glue be called water-proof or water-resistant? Obviously not. Such a glue would surely lose its adhesive power when subjected to the action of moisture for some time, and should at best be classed as semi-water-resistant.

Possibly the best way to improve a product is to set a high standard of excellence and let the manufacturer put forth his best efforts to meet the required standard. In order to improve the quality of the glues to be used in aircraft work it will be well first to classify properly the glues in use, determine the limits of each class and set specifications which each class shall meet. Then from time to time as each class is improved the specifications may be made more rigid. So long as manufacturers are permitted to sell water-soluble glues as water-proof, and semi-water-proof glues as absolutely water-proof and water-resistant, no real progress will be made toward the improvement of the various types of glues now available.

For many purposes water-soluble glues are good enough; for other purposes semi-water-proof glues will answer, and for still other purposes only really water-proof or water-resistant glues should be used.

A promiscuous and unintelligent use of the different types of glues not only leads to a general condemnation of all glues but it also discourages investigation aimed at the improvement of the several types of glues.

In view of the servere weather conditions which aerial work must meet, I shal venture to suggest that glues for aircraft work ought to be classified as non-water-resistant, semi-water-resistant and water-resistant; and that specifications for each class be so drawn as to distinguish the three grades. Such specifications should compel a proper classification and stimulate investigation which will improve each grade.



The Keller Propeller Carving Machine

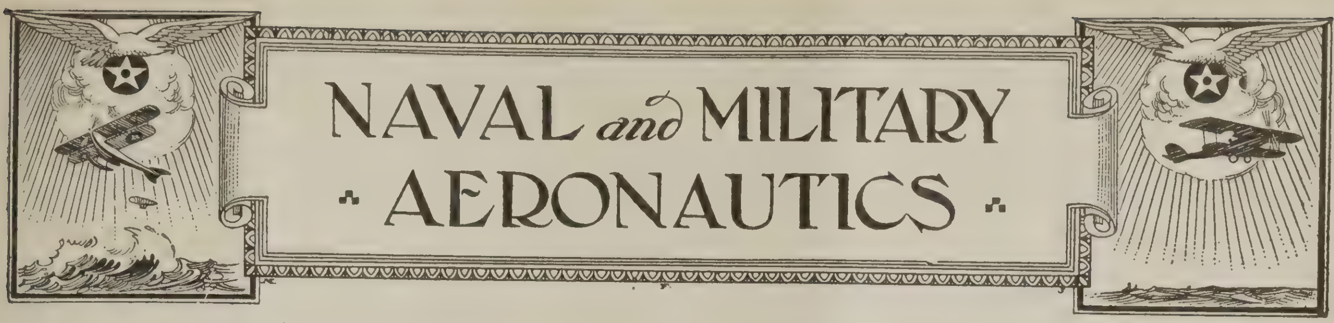
The Keller Mechanical Engraving Company have brought out a new machine for making propellers which should help, materially, the much needed production of propellers.

Their engineers have been untiring in rendering valuable assistance by giving the propeller manufacturers a completely worked out *method* and *real* service in addition to the machine.

The machine is about 38′ long, and about 14′ across at the widest part.

It is supplied regularly with two carriages or work tables, on each of which is mounted a model for one-half of the propeller, and on each side of the latter, one or more blanks to

(*Continued on page* 1193)



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to District Manager, Production, 870 Woodward Ave., Detroit, Mich.

Note 3—Report to Bolling Field, Anacostia, D. C.

Note 4—Report to Fort McPherson, Ga.

Note 5—Report to O i/c, Fisher Body Corp. Detroit, Mich.

Note 6—Report to Madison Barracks, Sacketts Harbor, N. Y.

Note 7—Report to Aviation General Supply Depot, Americus, Ga. Wire DMA.

Note 8—Report to Aviation Section, Newport News.

Note 9—Report to Aviation Mechanics' School, St. Paul, Minn.

Note 10—Report to Lieut. Colt, Metz Motor Co., Waltham, Mass.

Note 11—Report to Army Balloon School, Lee Hall, Va.

Note 12 — Report to Manager Finance Bureau Aircraft Production, 870 Woodward Ave., Detroit, Mich.

Note 13—Report to Hoboken, N. J.

(Special Orders Nos. 174-177 Inc.)

A

Apelt, Cary P.	LHV
Acton, Gene William	SLA; CRI
Allinger, Daniel T.	SMM
Adams, Orson, Jr.	WFO
Athey, Clifford D.	FRF
Addington, Edward P.	TFT
Auchard, Oliver C.	TFT
Anderson, Edwin F.	DIK
Abel, Allison A.	DIK
Altman, Harry L.	KST
Armstrong, Russell Bernard	SLA; KST
Alexander, George Lehner	SLA; BFT
Andrews, John Parke	SLA; CFT
Ailsworth, Richard Earle	SLA; KST
Agee, William Tillmon	SLA; BFT
Allen, George Albert	SLA; BFT
Ashby, William Todd	SLA; BFT

B

Brady, Frank L.	DIK
Brown, Raymond F.	DIK
Barnes, Harold L.	ASM
Bell, William H.	ASM
Berglung, Eugene N.	ASM
Brown, Reuben J.	ASM
Belting, John Theodore	SLA; CRI
Bacon, Max E.	GLC
Batten, Eugene C.	GLC
Blain, John D.	GLC
Brock, William Archibald	SLA; BFT
Bridges, Kenneth Lawler	SLA; CWT
Bramlette, James L.	VBW
Bradens, William M.	GLC
Baughan, Stephen, D.L.	GLC
Blair, Byron S.	GLC
Bassett, Lowell Whittier	SLA; LDT
Botts, Graeme Gayle	SLA
Burns, Edward	DMA
Burton, Charles Vance	SLR; CSO
Barnes, James A.	APR
Baldwin, Thomas S.	MJR
Bicknell, George Waldo	SLR; ALF
Blackburn, James M.	EOT
Bogel, Galitzin, N.	EOT
Bishop, Albert B.	CJS
Blackler, Perry W.	BST
Brown, Harry M.	DAF
Blanchard, Francis E.	DIK
Barnes, Earl D.	BST
Berger, Andrew B.	CPR
Beckford, George F.	DIK
Burrows, Paul Edmund	SLA; SBI
Byrnes, Ralph John	SLA; SBI
Beutell, Russell L.	FRF
Brainerd, Walter M.	FRF
Brown, Harry G.	DIK
Bailey, Augustus O.	DIK
Barnard, William T.	DIK
Boonstra, Henry George	SLA; CRI
Barker, Charles M.	PFO
Brown, Ernest L.	PFO
Barnhart, Leroy W.	PFO
Boone, Ralph R.	DIK
Belsky, Charles J.	DIK
Batty, John H.	LHV

FOREIGN NEWS

FRANCE

An official statement on aviation says: "During the month of July 184 enemy aeroplanes were downed. One hundred and fifty-four enemy aeroplanes were seen falling out of control inside the enemy lines, of which number fifteen had been damaged by the fire of our aircraft guns. Thus 338 enemy machines were destroyed or badly damaged."

French aviators again participated in the battle on Aug. 9th, in conjunction with the infantry, harassing the enemy with bombs and machine guns. Our squadrons took part in several battles in the air, in the course of which fourteen German aeroplanes were downed. Nine captive balloons were set afire.

Our formations dropped more than twenty-three tons of projectiles on troops assembled in the valley of the Avre and other parts of the battle-zone as well as in the rear. During the night our airmen threw nearly seventeen tons of bombs on the stations at Ham, Tergnier, Nesles, and Hombleux, and on several bivouacs, causing fires and explosions.

Gen. von Einem's son, who was a crack aviator of the German flying corps, was shot down inside the French lines recently and is now a prisoner of war.

French airmen have been very active in harassing the retiring enemy. Enemy concentration points around Lassigny were bombarded heavily, causing heavy German losses.

French aeroplanes to the number of 120 dropped twenty-three tons of bombs in the battle area on Aug. 11.

"During the day of Aug. 11 our bombing squadrons carried out successful expeditions over the enemy lines. Concentration centers, road crossings, bridges, and railroads were copiously drenched with projectiles.

"Marching columns were sbjected to machine gun fire. The important center of communication of Porquericourt received for its part seventeen tons of explosives during the day.

During the day of Aug. 11 our bombing squadrons carried out successful expeditions over the enemy lines. Concentration centers, road crossings, bridges and railroads were copiously drenched with projectiles.

"Marching columns were subjected to machine gun fire. The important center of communication of Porquericourt received for its part seventeen tons of explosives during the day."

Numerous transports have been bottled up. A total of fifty-seven tons were dropped, of which twenty-two tons fell during the night on the regions of Ham, Noyon, Guiscard and Tergnier.

The same day fifteen aeroplanes and four captive balloons were downed, and twenty-one machines were put out of action by our pilots, operating in collaboration with American crews.

On the night of Aug. 12-13 our bombarding aeroplanes dropped twenty-nine tons of bombs on stations and enemy establishments at Tergnier, Ham, Nesles, St. Quentin, and Noyon. Fires are reported to have been seen at several places.

On the 12th eleven German aeroplanes were brought down or put out of action. Four captive balloons were destroyed.

Aviation—Our crews have downed or put out of action twelve German machines. On the night of Aug. 13-14 our bombing machines dropped thirty-two tons of projectiles on enemy objectives. Tergnier, St. Quentin, Ham and Noyon, bivouacs in the region of Ognolles and the railroad stations at Maison Bleue, Guigni-court and Chatelet-sur-Tourne were copiously bombarded. Violent fires broke out at Ham and Noyon, which received as their share fifteen tons of explosives.

GREAT BRITAIN

"On August 7 observation was rendered difficult by grounded mist. However, a considerable amount of reconnaissance and photography was carried out. Over seventeen tons of bombs were dropped during the day with good results, and a large number of combats took place. Fifteen hostile machines were brought down and seven driven down out of control. Two of our machines are missing.

"A ton of bombs was dropped during the night, when operations were hampered by bad weather. One of our night-flying machines is missing."

The following official communications was issued by the air ministry:

"On the morning of the 8th our machines carried out a successful attack on the explosive factories at Rombach (Alsace Lorraine, ten miles north-west of Metz). Good results were obtained. All our machines returned."

Allied aeroplanes are making it hot for German towns, according to advices reaching London. Their acitivities have increased within the last ten days, forcing the enemy to detach a large number of fighting machines from the front in order to protect the menaced towns.

During a recent raid over Saarbrucken the allied aviators encountered forty German fighting planes. This is regarded as an indication of the very serious moral as well as the military effect that the air raids are having on Germany.

The statement of Aug. 9 reads:

On Aug. 8 our aeroplane squadrons co-operated with other arms on the battlefront throughout the day. The line reached by our attacking infantry was reported by our contact aeroplanes. The position of the hostile artillery in action and columns of German infantry and transport on the march were signaled to our guns by our artillery machines. Other machines supplied our advance troops with ammunition from the air.

Co-operation with the tanks was carried out systematically. Our machines assisted the tank crews with information, attacked strong points and other opposition with bombs and machine-gun fire, and by dropping smoke bombs along the line of their advance assisted to conceal the approach of the tanks from the enemy.

Our contact machines working with the cavalry rendered valuable service. Flying low in front of our advancing line, our fighting squadrons shot at and bombed the enemy in his retreat, causing havoc among the masses of hostile troops and transport on roads congested with traffic.

Our bombing squadrons flying a few hundred feet from the ground attacked trains, railway junctions, and bridges.

Forty-eight hostile machines are reported as destroyed by our aeroplanes and seventeen others were driven down out of control. Five hostile balloons were shot down in flames. Fifty of our own machines are missing, most of these casualties being due to fire from the ground. One of our night-flying machines also failed to return.

On Aug. 9 our airmen continued the work of co-operating with the British infantry, artillery, cavalry and tanks on the battlefront. German troops and transport were again attacked with bombs and machine-gun fire from a low height whenever a suitable target offered. The Somme bridges were heavily bombed by day and night.

Elsewhere along the British front the activity in the air has been slight.

The official communication issued on Aug. 11 says:

On Aug. 10 there was intense fighting in the air, mainly over the battle area.

Forty-one enemy machines were destroyed during the day, and twenty were driven down out of control. Twelve of our machines are missing.

Twenty-three and one-half tons of bombs were dropped by our airmen in the course of the day, and thirty-one tons, principally upon bridges and stations in the Somme Valley, during the following night.

The work of reconnoissance and observation for artillery fire was actively carried on along the whole front, while co-operation with the other arms in the battle has been actively continued.

The amount of small-arm ammunition fired from the air upon retreating enemy troops and transport has broken all recent records. On the night of Aug. 10-11 two hostile night bombing machines were brought down by us. The first was a giant German machine with five engines and a heavy load of bombs.

Anti-aircraft fire has also shot down two other enemy machines during the last two days.

French aviators again participated in the battle Friday in conjunction with the infantry, barassing the enemy with shells and machine guns. Our squadrons took part in several battles in the air, in the course of which fourteen German aeroplanes were downed. Nine captive balloons were set afire.

Our formations dropped more than twenty-three tons of projectiles on troops assembled in the valley of the Avre and other parts of the battle zone, as well as in the rear. In the course of the night our airmen threw nearly seventeen tons of bombs on the stations at Ham, Tergnier, Nesies and Hombleaux and on several bivouacs.

An official communication issued by the Air Ministry announced that an air raid has been made on Karlsruhe. It was stated that there was an explosion in the Karlsruhe station.

The communication of Aug. 12, reads:

"On the afternoon of the 11th instant, in addition to the bombing previously reported, a few bombs were dropped on the triangle of railways at Metz.

"On the night of the 1th-12th instant our machines attacked two hostile aerodromes and various ground targets with bombs and machine gun fire.

"On the day of the 12th inst. one of our squadrons, despite unfavorable weather conditions, successfully attacked the aeroplane and chemical works at Frankfort. Bursts were observed well in the center of the objectives. Large numbers of enemy aeroplanes attacked and kept up a running fight for about thirty miles. Two enemy aeroplanes were destroyed. All our machines returned safely.

"Another of our squadrons attacked the hostile aerodrome at Hagenau with excellent results. This squadron, just after crossing the lines, met large numbers of enemy aeroplanes and at once decided to give battle. As the result of severe fighting four enemy aeroplanes were destroyed and one other machine was driven down out of control. Two of our machines are missing.

"The squadron reformed after this fight and proceeded to bomb its objective. A direct hit was obtained on a large hut in the aerodrome and a bomb fell among four enemy machines on the ground and destroyed them."

GERMANY

The German official report for Aug. 8 said:

There has been very lively aerial activity over the battlefield. We have shot down twenty-three more enemy aeroplanes and one captive balloon.

German general headquarters issued the following statement on Aug. 12:

Seventeen enemy aeroplanes and four captive balloons were shot down yesterday. In July, 518 enemy aeroplanes were shot down by our airmen on the German front and 69 by our anti-craft guns. Thirty-six captive balloons also were shot down. Two hundred and thirty-nine of these aeroplanes are in our possession and the others were seen to fall inside the enemy's position. We lost 129 aeroplanes and 63 captive balloons in battle during the same period.

The German statement of Aug. 14 says:

"A British bombing squadron on its way to raid our home territory was engaged by our chasing forces before reaching its objective and forced to return after a loss of five aeroplanes.

"Yesterday twenty-four enemy aeroplanes and one hostile balloon were shot down."

An official despatch received at Geneva on Aug. 15 from Frankfort, Germany, says that Monday morning at 9 o'clock that city was attacked by twelve enemy aviators, who dropped twenty-six bombs, killing twelve persons and injuring five others.

Reports from Basel, however, assert that the casualties were far more numerous. These say that a bomb fell in the crowded Kaiserstrasse, killing many persons and stopping the street cars; that another fell in the middle of the large station and several in its vicinity, while two more fell in the barracks, and still another near Goethe's house, which was undamaged.

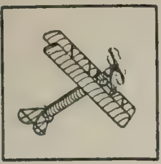
The Basel despatch says the aerial attack has increased the panic in the Rhine towns.

ITALY

The War Office statement issued on Aug. 12 says:

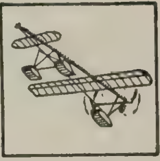
Along the whole front the fighting activity has been moderate.

Five hostile aeroplanes were downed by us. Flying over Feltre and the Seven Communes, Italian aeroplane squadrons attacked from low heights recognizable hospitals. Patients and other persons were killed.



MODEL NEWS

Edited by John F. McMahon



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Baltimore, Md.
NEBRASKA MODEL AERO CLUB
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DENVER MODEL AERO CLUB
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THE ILLINOIS MODEL AERO CLUB
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SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg.,
Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
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MODEL AERO CLUB OF OXFORD
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Model Aeroplane Building as a Step to Aeronautical Engineering

The construction of the Tail, Rudder and Fin needs no explanation other than the dimensions in the accompanying drawing. One thing must be remembered, that is, to make these members as light as possible without sacrificing strength.

The model builder must remember that every ounce of weight on the tail means about eight ounces at the nose in order to bring the center of gravity where it should be, at a point over the thumb and indicated by the arrow in the side view sketch shown at the bottom of the drawing.

These parts are covered with silk and placed in position as shown in the sketch of tail and rudder assembly. The tail should be fastened rigidly but the rudder should be so fastened as to allow free movement to set rudder in order to correct the turning of the model caused by the twist of the propeller, or when attempting to do stunts in the air.

When assembled the model should be doped with the celluloid solution described in an earlier issue. (Numerous inquiries have been received as to the amount of celluloid and banana oil used in this combination. A piece of thin transparent celluloid, 4x4" dissolved in a pint of pure banana oil will give the best results. If the banana oil is not pure it will turn white when dry.

The propeller is cut from a block of soft white wood ¾" thick to the shape shown in the sketch. It is made fairly heavy in order to hold the nose of the machine down and to assist in properly locating the center of gravity. In fact the propeller can be made to weigh as much as two to three ounces, and even with this weight it might be necessary to put an extra ballast in the nose of the machine because the center of gravity must come at the point shown in the sketch. The model can be balanced easily by holding as shown in the sketch, if the tail is heavy it will be necessary to put an additional weight at the nose of the machine. Should the nose be heavy you need not worry, because a little nose heaviness does not harm the flying qualities much, and this can be corrected by giving a slightly greater angle of incidence to the main planes; or a little lesser or negative to the tail plane.

When attempting to fly the model I would advise selecting a field where the grass or weeds are long because the model may be a little "out of balance" and make a sharp nose dive or "sit on its tail" and the long grass will act as a cushion.

The model builder should have little trouble laying out and assembling the model, the Plan, Front and Side views should give all the information necessary.

If the instructions I have given are strictly carried out, the model builder will have little trouble in making the model fly 250 to 500 feet. (I might call attention to the measurements of the fuselage through an error, I forgot to state that the dimensions given alongside of each strut in the side view and at the bottom in the top view, shows the length of the struts and not width of the body. For instance, the greatest dimension given was 1⅞" adding the thickness of two ⅛" longerons will make the body 2⅛" which is correct).

To finish the model paint Red, and blue stripes on the rudder as indicated in the drawing, Red at the rudder post and equal space of white and blue outside. The circles on the wings are, outside red, next blue and the inside circle left, white.

We will take up the construction of a compressed air motor next.

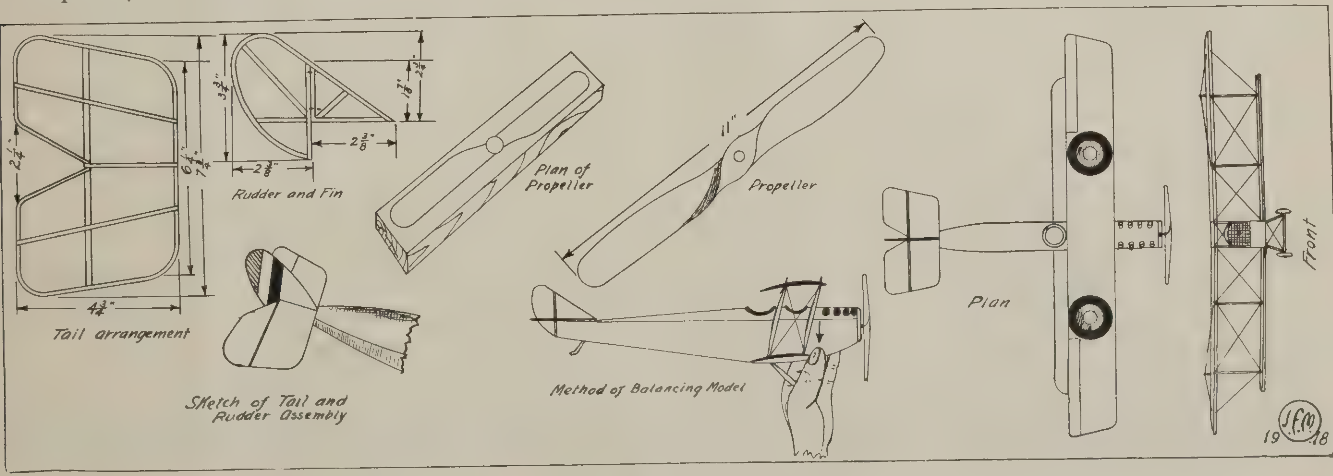
(To be continued)

Correspondence Model Aero Club of Rockford, Illinois

Mr. F. Spalding, who was a former member of the "Correspondence Model Aero Club of Babylon, L. I.," now disbanded, notifies me he is about to start a club of the same name with its headquarters at Rockford, Illinois.

He would like to hear from former members of the older club, as well as other model builders, or beginners who would like to follow up Elementary Aeronautics. Mr. Spalding says the trouble with the old club was mismanagement and failure to answer inquiries. This will be entirely overcome by a system Mr. Spalding has in mind.

His address is No. 320 N. Main Street, Rockford, Illinois. Model readers will note the addition of two new clubs to the list at the top of the page.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The American Eagle-Man

By H. F. Greaves, 1st Lt., A.S.S.C., A.E.F., France

I

Blue spreads the sky above me
Gentle blows the Western wind,
I trundle the little "pursuit" out
And closely tuck me in.

II

The "Liberty" hums a merry tune
And seems eager to be off,
I gently wave the "mechs" aside
And swiftly soar aloft.

III

Below me spreads the country-side,
With camp and village, hill and mead;
I note the rivers silvery thread
And softly guide my flying steed.

IV

This is the life for bird and man,
My soul exultant is and glad,
While unbidden memory conjures up
The magic carpet of Bagdad.

V

I sit and dream of fairy tales,
Of Pegasus' wonderful horse,
Of twenty league boots and flying chests
And they seem a matter of course.

VI

I travel far on wings of the winds,
I see all the wondrous sights
That gladden the American Eagle's eye
Or dwell in Arabian Nights.

VII

Swiftly above the clouds we rise,
My magic steed and I,
And on the sheeny-fleecy things
We look down from on high.

VIII

Again we view the landscape o'er,
'Tis truly Mother Nature's lap.
And wrest the very secrets from
This ever-changing map.

IX

The trench, the gun, the tortuous road,
The wood or farmhouse grey,
I fix the menace or harmlessness
Then quickly speed away.

X

Sometimes we meet the dragon foe,
Then by virile or baffling loop,
We elude his deadly firey breath
And swiftly on his tail we swoop.

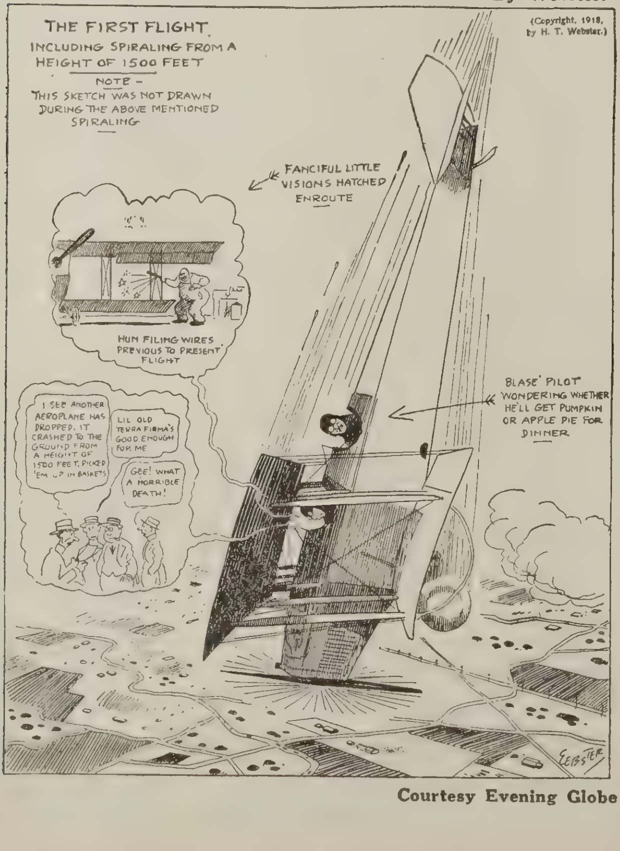
XI

Ofttimes the bursting shrapnel shells,
Like pursuing Trolls come after,
But soon we maneuver out of reach
Or pass them by with laughter.

XII

Then when the day is ended,
And golden-red is dyeing the West.
We gladly take the homeward route
And spiral down to rest.

The Thrill That Comes Once in a Lifetime. —By Webster.


(Copyright, 1918, by H. T. Webster.)
THE FIRST FLIGHT
INCLUDING SPIRALING FROM A HEIGHT OF 1500 FEET
NOTE – THIS SKETCH WAS NOT DRAWN DURING THE ABOVE MENTIONED SPIRALING
FANCIFUL LITTLE VISIONS HATCHED ENROUTE
HUN FILING WIRES PREVIOUS TO PRESENT FLIGHT
I SEE ANOTHER AEROPLANE HAS DROPPED. IT CRASHED TO THE GROUND FROM A HEIGHT OF 1500 FEET. PICKED 'EM UP IN BASKETS
LIL OLD TERRA FIRMA'S GOOD ENOUGH FOR ME
GEE! WHAT A HORRIBLE DEATH!
BLASE' PILOT WONDERING WHETHER HE'LL GET PUMPKIN OR APPLE PIE FOR DINNER
WEBSTER

Courtesy Evening Globe

At it, Boys!

I see some airships sailing,
A-sailing off so far,
And oh, they are all laden
With bombs for the Kai-zar.

There are bullets in the cabin,
And shrapnel in the hold,
The sails are all of linen,
And the masts of beaten gold.

The captains are all Yankees,
With khaki on their backs,
And when these ships begin to move
They'll drive the Germans back.

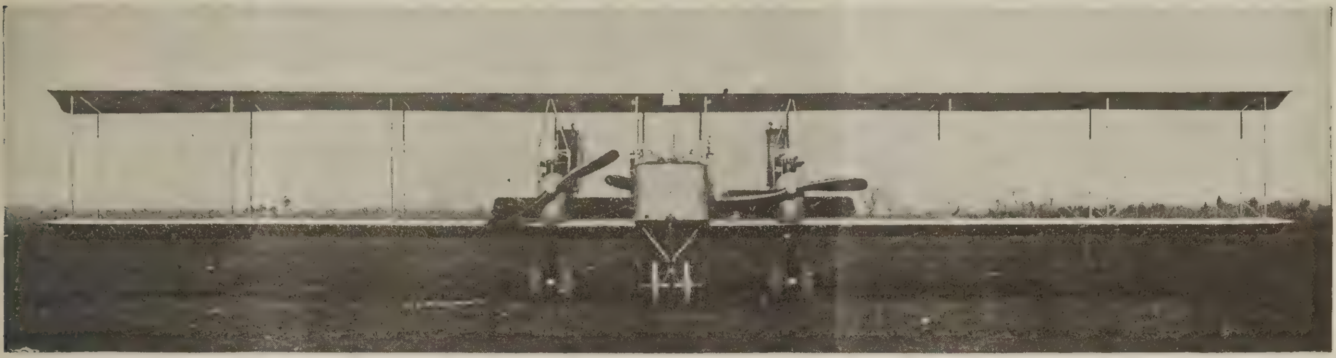
The Germans, they are brazen
With their bombs of Hellish gas,
But the Yankees, they will beat them
With the good old cannon sass.

F. B. S.

From Home

It doesn't make us very gay,
To know that you have gone away
To educate the Kaiser;
But we are very proud of you,
And know you'll do a thing or two
To make the old chap wiser.

—W. P. N.



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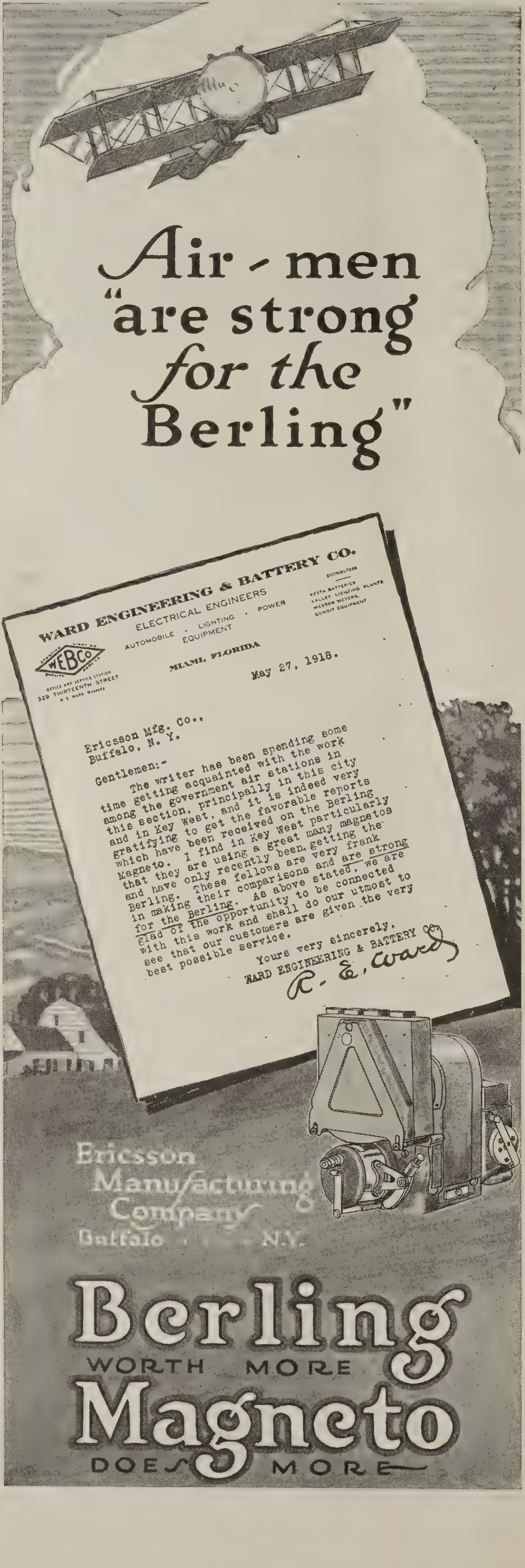

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R. E. WARD OWNER
MIAMI, FLORIDA

May 27, 1918.

Ericsson Mfg. Co.,
Buffalo, N. Y.

Gentlemen:-

The writer has been spending some time getting acquainted with the work among the government air stations in this section, principally in this city and in Key West, and it is indeed very gratifying to get the favorable reports which have been received on the Berling Magneto. I find in Key West particularly that they are using a great many magnetos and have only recently been getting the Berling. These fellows are very frank in making their comparisons and are strong for the Berling. As above stated, we are glad of the opportunity to be connected with this work and shall do our utmost to see that our customers are given the very best possible service.

Yours very sincerely,
WARD ENGINEERING & BATTERY CO.
R. E. Ward

(*Continued from page* 1162)

labor apply only to common labor at the present time, these restrictions will, as soon as possible, be extended to include skilled labor. In the meantime, recruiting of skilled labor for war production will be subject to Federal regulations now being prepared.

This drastic change in the Nation's labor program has been found necessary in order to protect the employer and the employed, to conserve the labor supply of the communities and to cut down unnecessary and expensive labor turn-over (which, in some cases, is as high as 100 per cent a week), and to increase the production of essential.

While non-essential industries will be drawn upon to supply the necessary labor for war work, the withdrawal will be conducted on an equitable basis in order to protect the individual employer as much as possible.

Under the operating methods adopted, the country has been divided into thirteen Federal districts, each district in charge of a superintendent of the U. S. Employment Service. The States within each district are in turn in charge of a State Director, who has full control of the service within his State.

In each community there is being formed a local community labor board, consisting of a representative of the U. S. Employment Service, a representative of employers and a representative of the employed. This board will have jurisdiction over recruiting and distributing labor in its locality.

A survey of the labor requirements is being made, and in order that each community may be fully protected, rulings have been issued that no labor shall be transported out of any community by the U. S. Employment Service without the approval of the State Director; nor shall any labor be removed by the Service from one State to another without the approval of the U. S. Employment Service at Washington. Every effort will be made to discourage any movements from community to community or State to State by any other service.

This labor program has the approval of all producing Departments of the Government, through the War Labor Policies Board.

It must be understood that farm labor will be protected, for the industrial program distinctly includes special efforts to keep the farmer supplied with labor.

The requirement that unskilled labor must be recruited through the sole agency of the U. S. Employment Service does not at present apply in the following five cases:

1. Labor which is not directly or indirectly solicited.
2. Labor for the railroads.
3. Farm labor—to be recruited in accordance with existing arrangement with Department of Agriculture.
4. Labor for non-war work.
5. Labor for establishments whose maximum force does not exceed one hundred.

When the survey of labor requirements has been made and the aggregate demand for unskilled labor in war work is found, each State will be assigned a quota, representing the common labor to be drawn from among men engaged in non-essential industries in that State.

These State quotas will in turn be distributed among localities. Within each locality, employers in non-war work, including those who are only partially in war work, will be asked to distribute the local quotas from time to time amongst themselves. Quotas by localities and individuals are to be accepted as readily as they are for Liberty Loan and Red Cross campaigns. This plan of labor quotas is a protection for all communities.

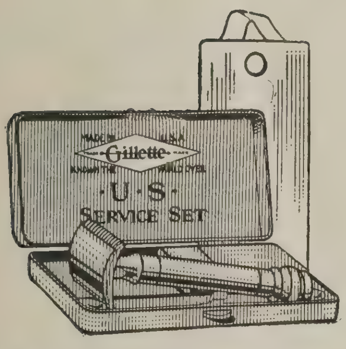
The object is to keep any community from being drained of labor, and to use local supply, as far as possible, for local demand. The situation, however, is such that in certain cases some men may have to be tranported over long distances.

You will note from the above outline that this is probably the most drastic action that the Government has taken since putting the National Army draft into effect. The absolute necessity for this program can be seen when it is realized that in Pittsburgh, for instance, there are advertisements calling for men to go to Detroit; while in Detroit street cars there are posters asking men to go to Pittsburgh. This same condition is apparent all over the United States and in the consequent shifting of labor a great part of our war effort is dissipated.

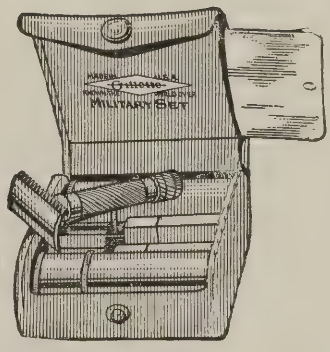
Because this is one of the greatest problems facing the nation today, we are asking that you give this matter your careful consideration. You will probably desire to carry some comment on this basic change in the Nation's labor methods, and we would suggest that if you desire to assign one of your men to look into this situation, the facilities of the Department of Labor and the U. S. Employment Service are at your disposal.

Yours respectfully,
J. B. DENSMORE, Director General.

Gillette SAFETY RAZOR



The New U.S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

The most practical of men is the fighting man

When it comes to razors, the fighting man wants his Gillette.

It saves him space. It saves him weight. It makes his shaving clean, quick, safe. It is the razor used by his bunky and his messmates — by his comrades under all the flags of the Allied Nations.

The Gillette is the *Service Razor* the world over.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal, P. Q., Canada

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

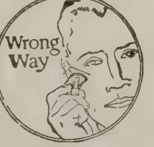
Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn.*

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.



Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·

National Wire Wheel Works, Inc.
of Geneva, New York

IS PREPARED
to accept orders for
wire wheels made to fit
all types of Airplanes

DELIVERIES ARE PROMPT
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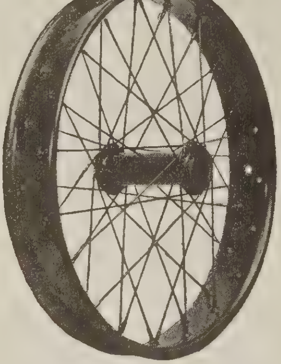


Borden, John A.	KST
Bovey, Sidney J.	Note 8
Blodd, Frank L.	Note 6
Baird, Walter Edward	SLA; RSD
Bass, Haskell Harris	SLA; GLC
Baker, Lee Allen	SLA; KST
Brown, George Harold	SLA; SBI
Blistain, George Anthony	SLA; SBI
Balderston, Jason Aldrich	SLA; BFT
Berkowitz, Ben	SLA; PMT
Brennan, Edward William	SLA; KST
Brown, Clarence Leon	SLA; SBI
Burk, Elmer Edgar	SLA; VBW
Bible, Dana Xenophon	SLA; CFT
Billett, Clifford H.	CJS
Bramlette, Milton Nunn	SLA; SBI

C

Chisum, Yenner Y.	CGC
Christie, Robert E., Jr.	CPA
Cochran, Robert Bryce	SLA; CFT
Christy, Wynn Oliver	SLA; CFT
Coffee, Harold L.	SLA; RSD
Cledinning, William R.	ELA
Carlson, Arthur George	SLA; CFT
Cadmus, Lemont A.	FLR
Christensen, Ezra A.	BST
Cooper, Francis J.	BST
Crandall, Gavin D.	FRF
Cooper, Francis Judd	SLA; KST
Cronin, Maurice J.	SLA; VBW
Carpenter, Frederick S.	CPR
Catching, Harry H.	GLC
Coffee, John A.	DIK
Crumley, Charles L.	FRF
Cotton, Horace George	SLA; RSD
Connelley, Iobert M.	BST
Clouse, Oles I.	DIK
Chatterson, Marshall C.	PFO
Cowen, Edward G.	FRF
Corbitt, Marsh M.	PFO
Campbell, Donald	DIK
Christy, Donald C.	GLC
Claude, Laurens	GLC
Clark, Hobart	BST
Croarkin, Paul C.	LHV
Cather, Jay Howard	FLR
Chamberlain, Clarence Duncan	SLA; CRI
Cochran, Emory E.	Note 4
Clayton, Wilbur Henry	SLA; VBW
Cullinan, John Francis	SLA; GLC
Cozier, Paul Merlin	SLA; RSD

D

Dhein, Orian Irvin	SLA; BFT
Dahlem, Earle C.	FRF
Dunlap, Lionel H.	TFT
Daly, George S.	BST
Dunn, Thomas F.	TFT
Draper, Arthur L.	FLR
Donaghue, Harold R.	TFT
Davis, Paul A.	PFO
Dwyer, Lawrence P.	PFO
Doles, John J.	SMM
Dow, John R.	BST
Donovan, Lawrence J.	LHV
Day, Robert R.	DIK
Dyer, Clarence A.	DIK
Duggan, James R.	DIK
Doty, David E.	TFT
Duke, John F. S.	DIK
Doering, Harold	EOT
Dawson, Joseph C.	DIK
Dussere, Louis	PFO
Duryee, Andrew B.	TFT
Davis, Clarke Fullerton	SLA; GLC
Drummey, John Francis	SLA; GLC
Davis, George Edward	SLA; RSD
Daly, George Sylvester	SLA; KST
Dubel, Marcus Gordon	SLA; CGC
deBettencourt, Danuel A.	FRF
Doyle, Stanley Morton	SLA; KST

E

Elliott, Milton	SLA; BFT
Engblom, Oscar H.	FRF
Eding, Gerrard J.	CPR
Evans, Stephen G.	FRF
Evans, Arthur Herbert	SLA; CRI
Elphinstone, Douglas C.	CPR
Eustis, Truman W.	CPR
Evans, Lawton B.	BST
Easter, William C.	TFT
Emery, Amos B.	TFT
Evans, Edwin B.	LHV
Elsey, George W.	GLC
Eaton, St. John L.	Note 5
Erney, Frederick Gordon	SLA; KST
Ely, Sherman Sheldon	SLA; CGC
Elliott, Merle Adams	SLA; RSD

F

Fitzgerald, Freeman Charles	SLA; PMT
Farnsworth, Tom D.	SLA; CFT
Ferguson, Elijah P.	CAF
Foster, Lee W.	EOT
Fulwood, Charles W., Jr.	EOT
Fisher, Ewing B.	DIK
French, Seth T.	BST
Fogg, Robert S.	DIK
Foster Thad V.	DIK
Friday, Ellsworth C.	EOT
Ford, Edgar K.	DIK
Folsom, Frank G.	PFO
Frere, Henry Bertram	SLA; KST
Fowler, Robert A.	HHN
Frost, Horace Wier	SLA

G

Griggs, Milton W.	FLR
Gray, Murray K.	SLA; VBW
Gregg, Harry W.	CGC
Ghee, Milton P.	LDT
Gault, John William	SLA; CWT
Gardiner, Chandler Brewer	SLA; CWT
Garwood, Sterling Marion	SLA; BFT
Grey, George V.	MAT
Grosvenor, William	PUP
Gibson, Glen T.	WFO
Garrett, Joseph R.	EOT
Greene, Lew A.	BST
Garrett, John W.	TFT
Goddard, Glenn	DIK
George, George B.	WFO
Glassco, James Spruill	SLA; GLC
Goetjen, Floyd Leslie	SLA; RSD
Garrison, Relph Hamilton	SLA; GLC
Gouin, Walter F.	SLR; CJS
Goodwin, Grover	SLA; RFT
Gehan, Jerome Standley	SLA; RSD
Goembel, William P.	DIK
Guild, Paul Conard	SLA; CRI

H

Hill, Charles	DIK
Harter, Earl Clark	SLA; KST
Hogg, Edwin Ruvthen, Jr.	SLA; PMT
Harper, Oliver C.	GLC
Heston, Adrian, O.	GLC
Hooker, Charles J.	FRF
Hayward, Lawrence A.	SLA; VBW
Hoffman, John S.	GLC
Henderson, Albert H.	DMA
Hilliard, Walter B.	DMA
Horn, Norman Elmore	SLA; PMT
Hawkridge, Leslie D.	FLR
Hardey, Donald E.	FRF
Hitt, Arnold D.	SMM
Hayes, Martin A.	FRF
Handwerck, Morris C.	FRF
Hansen, James H.	EOT
Heath, Edward D.	EOT
Hopkins, Ward D.	EOT
Harris, George E.	FLR
Harrigan, Cornelius H.	EOT
Honn, Laurence C	EOT
Hickman, Cecil R.	DIK
Hornig, William F.	DIK
Houlton, Raymond C.	DIK
Hosier, John B.	BST
Hastings, Charles E., Jr.	GLC
Heinitsch, George M.	LHV
Haines, Harold H.	ASM

Hunter, Archie D.......PFO
Hastings, Charles E., Jr.......GLC
Hillix, Albert F.......TFT
Haugen, Karl M.......DIK
Harvey, Harold M.......TFT
Hutchins, Benjamin B.......Note 13
Hoddick, Alvin C.......Note 13
Henry, Kenneth Malcolm.......SLA; DAP
Horn, Malchior H.......HHN
Hahnel, William John.......SLA; CWT
Harrington, John Patrick.......SLA; KST
Hawkinson, John Leland.......SLA; SBI
Harper, Maitland Curgenven.......SLA; PMT
Hayden, Arthur Dorr.......FLA; DAP
Hooker, Joseph Kilbourne.......SLA; DAP
Hayes, Charles Lee.......SLA; KST
Hanson, Bert J.......FRF
Hogan, William Neil.......SLA; BFT
Howard, Elmer Newton.......SLA; BFT
Henderson, Hugh Murphy.......SLA; BFT
Hudspeth, Clyde Everett.......SLA; KST
Herring, William Douglass.......SLA; DAF
Harrigan, Thomas F.......DIK
Harding, Rowland R.......DIK

I

Ihrig, Howard Kirsch.......SLA; CAF

J

Johnson, George Tebo.......SLA; KST
Johnson, Perry V.......PFO
Jackson, John S.......PFO
Jones, Ernest E.......DIK
Jones, Donald T.......DIK
Jones, William F.......DIK
Jones, Stanley B.......ASM
Jacoby, John E.......Note 2
Johnson, Raymond Charles.......SLA; BFT
Jacobs, Sydney Bradshaw.......SLA; DAP
Judge, Joseph B.......FRF
Jones, Donald Turner.......SLA; DAF

K

Knoblock, Frederick L.......SRC
Kane, Clarence P.......DMA
Kile, Neil Everett.......SLA; TFT
Kesler, Gerald L.......DIK
Kennedy, Marcus J.......FLR
Kuhn, Herbert R....... DIK
Kirby, Marquis L.......BST
Keiner, Carl W.......DIK
Kerr, Henry D.......WFO
Kraus, Edwin J.......PFO
Kultgen, John H.......EOT
Kinnebrow, Edward R.......LHV
Korman, Howard.......DIK
Kent, Thomas T.......GLC
Kinkade, Kennish C.......DIK
Koch, Albert N.......DIK
Klingaman, Earl J.......DIK
Keeler, John F.......Note 9
Krug, Frank W.......SLA; TFT
King, Charles.......FRF

L

Lundgren, Theodore S.......EOT
Lowe, Herman J.......LHV
Lawton, William Wallace.......SLA; PMT
Loesel, George O.......GLC
Lenoir, Whitman H.......PFO
Lundgren, Edgar E.......PFO
Little, Roy A.......FRF
Lenderking, Louis T., Jr.......DIK
Larkin, JohnA.......CPR
Lawson, Harry E.......PFO
Luddy, Joseph L.......PFO
Leche. Eric D.......DIK
Lea, Royal B.......TFT
Linman, Luke E.......DIK
Leslie, John W.......WFO
Lathropm, Julian L.......FRF
Lawhon, Guy B.......DIK
LaMonte, Edwin B.......DIK
Liensch, Charles F.......GLC
Lundberg, Henry Benjamin.......SLA; CFT
Lowry, Edward Brockway.......SLA; CWT
Locklear, Ormer Lester.......SLA; BFT
Lutz, Ernest Welch.......SLA; KST
Love, Lewis.......SLA; DAF
Leonhardt, Elmer George.......SLA; GLC
Levitt, Glenn B.......DIK
Lawton, William W.......FRF
Lyall, Paul Crouse.......SLA; EOT
Leisure, George S.......FRF

M

Mathews, Herbert Stephen.......SLA; CWT
Myers, George I.......DIK
Miller, Felix B.......DIK
Mueller, Paul W.......SLA; VBW
Moise, Harold.......SLA; DAF
Morris, David B.......EOT
Magill, James W.......FRF
Morriss, Charles W.......FRF
Murphy, Charles C.......FRF
Mallette, Lester D.......WFO
Maxwell Warren A.......FRF
Midyette, Dayton R., Jr.......EOT
Mallory, Louis C.......LHV
Magee, Christopher.......PFO
Martin, Milton R.......PFO
Miller, Charles E.......PFO
Mengel, Herman.......TFT
Moore, James M.......PFO
Mabry, Harry C.......FRF
Marberry, Jason M.......DIK
Morgan, Diodate.......DIK
Miskovsky, Robert J.......FRF
Morehead, Hobart Emmett.......SLA; RSD
Martin, John H.......FRF
Moon, Harold F.......DIK
Miller, Boynton K.......WFO
Mayfield, Hollace E.......DIK
Mason, Edward J.......DIK
Mayor, Herbert C.......DIK
Mayo, Robert C., Jr.......SMM
Mason, Chauncey C.......DIK
Moynihan, Frederick M.......DIK
Martin, Leo C.......SMM
Miller, Daniel W.......DIK
Miller, Charles F. H.......WFO
Mitchell, Donald H.......TFT
Magee, Richard Hartnett.......SLA; CWT
Myers, Devereux M.......Note 3
Mahannah, Alva Ernest....... SLA; CWT
Metzger, Bernard Lewis.......SLA; SBI
Macks, Robert G.......SLA; LDT
Markham, John A.......Note 8
Murphy, Clement John.......FRF
Moore, Benjamin Logan.......SLA; CAF
Morgan, William T., Jr.......SLA; CFT
Miller, Eugene John.......SLA; TFT
Mast, Walter Emanuel.......SLA; CFT
Mauce, Leonard D.......DIK
Mahan, John Henry.......SLA; GLC
Moon, Frank L.......RSD

Mc

McClees, Ralph Lewis.......SLA; SBI
McGraw, Will C.......BST
McDowell, Alfred Alexander.......SLA; RSD
McCormick, Ralph C.......EOT
McGrath, Michael F.......EOT
McCormack, Earl N.......FRF
McKnight, Ewell.......SLA; CWT
McGehee, Abner F., Jr.......EOT
McGlone, John P.......DIK
MacLean, Norman R.......DIK
McCabe, Roscoe E.......GLC
McDonald, James Ellis.......SLA; RSD
McCaffrey, Harry F.......DIK
MacNeil, Bruce.......MAT
McAdow, Lewis H.......Note 7
MacDonald, Neil C.......Note 3
McDowell, Lloyd James.......SLA; KST

N

Nolan, Philip Edward.......SLA; GLC
Newcomb, Paul Herman.......SLA; CFT
Norris, Fred Percy.......SLA; RSD
Nester, John F.......SLA; VBW
Neubauer, Arthur J.......KST
Negley, V. W.......FRF
Nelson, Luther.......TFT
Neely, John E.......DIK
Neubauer, George R.......TFT
Newman, Augustus L.......SMM
Noyes, Linwood I.......FRF
Nelson, John H.......DIK
Nolte, Julius M.......DIK
Nolan, Philip E.......DIK

O

Oertel, Robb Church.......SLA; BFT
O'Hearn, Francis M.......DIK
Orgill, Kenneth Willins.......SLA; GLC
Ozier, Richard Paul.......SLA; GLC
O'Neill, John Francis.......SLA; LDT

P

Pottle, Vincent F.......DMA
Pierce, Theron E.......GLC
Peterson, Frank Lynn.......SLA; DAF
Pearson, Robert.......GLC
Pilkington, Fred W.......FRF
Palmer, Hubert P.......GLC
Parker, Harold.......DIK
Payne, Franklin S.......BST
Pavey, Smith W.......BST
Pearson, Russell H.......PFO
Parker, Kenneth H.......DIK
Preble, Robert C.......DIK
Pickard, Porter L.......DIK
Pennebaker, Charles T.......DIK
Packard, Harold A.......FRF
Petraborg, Jerrold A.......DIK
Pugh, Richard Owen.......SLA; RSD
Pyatt, Kenneth Randolph.......SLA; GLC
Pickard, Porter L.......SLA; CAF
Penick, Mark Albert.......SLA; CFT
Pinckney, Dunbar William.......SLA; CFT
Pratt, Daniel Harry.......SLA; KST
Perrin, Elmer Daniel.......SLA; SBI
Peterson, Helge Anthony.......SLA; CFT
Parker, Charles Wilson.......SLA; GLC
Pierce, Leonard R.......DIK

R

Rooney, Albert William.......SLA; KST
Ries, Edward Fritz.......SLA; PMT
Rice, Franklin Dryden.......SLA; WFO
Rennebaum, Ernest Henry.......SLA; CFT
Russell, Foster.......SLA; DAF
Reeve, Orson L.......SMM
Ross, Lucius G.......SMM
Rodham, Clarence John.......SLA; CGC
Ryder, Gerald Allen.......SLA; KST
Rowe, Charles B.......SLA; VBW
Robson, William Wallace.......SLA; CFT
Rundle, W. B.......SLA; KST
Ragsdale, Grover Cleveland.......SLA; GLC
Roach, Howard Laverne.......SLA; DAF
Reed, Max E.......GLC
Ruegg, Joseph Arnold.......SLA; DAF
Robinson, Fernando A.......DIK
Roberts, Ray C.......GLC
Ragsdale, Grover C.......DIK
Ransome, Philip G.......DIK
Radford, William A., Jr.......DIK
Roehlk, John.......DIK
Roberts, George L.......PFO
Ramsay, Robert W.......DIK
Ricciardi, Attilio.......EOT
Rosenfield, Harold.......Note 2
Rollins, Carson W.......FRF

S

Stapleton, Charles Edward.......SLA; KST
Snyder, Laurence Nelson.......SLA; CAF
Simmons, Walter Clay.......SLA; KST
Smith, Dean Cull.......SLA; SBI
Sands, Austin L.......EOT
Sands, Austin Ladyard.......SLA; RWT
Shannon, Harold Evans.......SLA; CRI
Smith, Albert, Jr.......SLA; SBI
Starr, Robert Lyndon.......SLA; SBI
Shepard, Frederick B.......FRF
Streeter, Edward B.......FRF
Seaton, John W.......FRF
Squires, Paul R.......FRF
Steinberg, John C.......FRF
Slocum, Russell W.......DIK
Schoonmaker. Earle Winslow.......SLA; CWT
Slocum, Donald.......SLA; BFT
Saal, Raymond Henry.......SLA; KST
Spoffard, Benjamin D.......FRF
Shaw, Harold Hughes.......SLA; RSD
Schaefer, Julius E.......FRF
Smith, George Daniel.......SLA; CRI
Sanders, William Percival.......SLA; KST
Smith, Andrew Raymond.......SLA; KST
Sogge, Richard Charles.......LA; GLC
Stalter, Charles C.......SMM
Smith, Samuel R.......DIK
Smith, Frederick K.......EOT
Sultzer, Norman W.......TFT
Sundstrom, Olaf.......TFT
Sipe, Harold G.......SLA; VBW
Shultz, Henry J.......SLA; VBW
Shaw, Donovan L.......HHN
Stanberg, Stanley Ray.......SLA; EOT
Stenhouse, Lester Ulrich.......SLA; KST
Smith, Wayne B.......SLA; CGC
Stahlberg, Oscar A.......SLA; VBW
Sale, William E.......SMM
Sigward, Sylvester L.......DIK
Swinson, Casper D.......DIK
Schank, Harry E.......FRF
Smith, Bernard R.......GLC
Smith, Samuel Rex.......SLA; RSD
Smith, Walter C.......DIK
Smith, George M.......TFT
Soule, Arthur Logan.......SLA; KST
Sawyer, William G.......DIK
Shay, Carleton C.......PFO
Stites, James W.......PFO
Southwick, Glen H.......DIK
Shafer, Wayne.......DIK
Stough, Robert A.......DIK
Stacy, Owen P.......DIK
Stewart, James D.......LHV
Sandvigen, Gilbert T.......GLC
Swain, Francis W.......FRF
Sullivan, Charles W.......DIK
Stephenson, George E.......WFO
Sperry, Ernest L.......DIK
Strickland, Chauncey J.......Note 3
Schweser, Harold G.......Note 11

T

Tillet, John.......SLA; GLC
Thompson, Lyman H.......RSD
Tyler, Oscar Wallace.......SLA; KST
Thomas, Mark P.......FRF
Towle, Ellingwood Hubbard.......SLA; CFT
Tanner, Olav John.......SLA; CFT
Thorne, William Bolster.......SLA; RSD
Twaddle, Chester.......SLA; CRI
Toll, Arne W.......FRF
Thompson, Harry Scott.......SLA; RSD
Tinsley, George C.......FRF
Traer, Glenn W., Jr.......SMM
Tupper, Wilbur D.......DAF
Trefry, Howard Worcester.......SLA; SBI
Tresidder, Don.......SLA; SBI
Tighe, Louis T.......DIK
Thomas, James R.......BST
Thomas, Arthur E.......DIK
Taylor, Thomas P.......DIK
Tysowski, Joseph G.......Note 13

U

Underwood, Thomas Ingle.......SLA; PMT

V

Vandeveer, Harry Earl.......SLA; GLC
Vernon, Charles Clark, Jr.......SLA; CWT
Vieb, Walter F.......DMA
Van Auken, Wendell Grant.......SLA; CFT
Vivian, Harry M.......DMA
Van Arsdale, Ray C.......DIK

(*Continued on page* 1191)

The VICTOR AIRCRAFT CORPORATION

TRADE MARK

Manufacturers of

AIRPLANES *and* SEAPLANES

For Military and Sporting Purposes

FACTORY

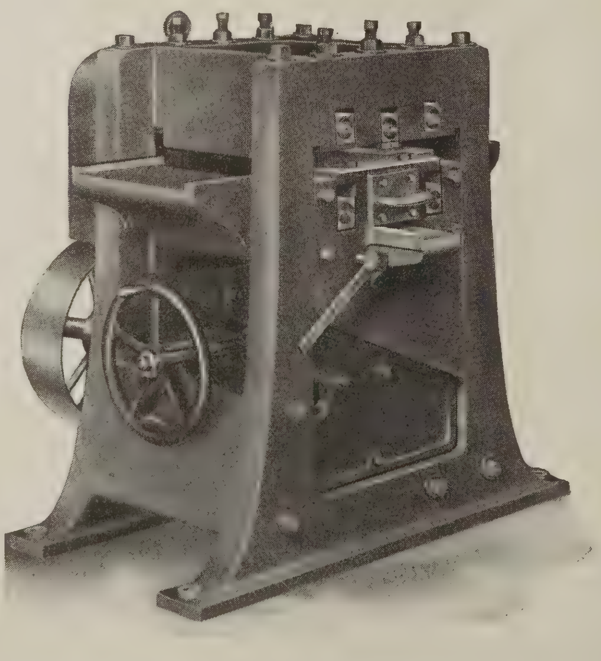
Freeport, Long Island, New York

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY

Toothing Machine



Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog
and samples of toothing

Baxter D. Whitney & Son
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(*Continued from page* 1189)

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W

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Y

York, John Y., Jr	KST
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Young, Fred	SLA; RSD
Young, Carleton E	DIK
Yost, Lloyd Oscar	SLA; BFT
Yackey, Wilfred A., Jr	TFT

Z

Zabriskie, George Albert	SLA; SBI

Urges That One Man Head "Air Service"

Mr. Hugh L. Willoughby, Aeronautical Engineer, has written the following to "The Reservist":

The Chalet, Newport, R. I.,
August 3, 1918.

"Dear Sir:

"The reason that the 'Air Service' has got into such a terrible muddle lately is from the fact that there has been too many heads with authority to it.

"Congress voted all the money and more than was necessary to build 30,000 aeroplanes.

"This lack of centralized authority, capable of forming a fixed policy, was shown in the building of the Liberty motor, so many changes were made from time to time, that at the end of the year, the production was almost reduced to zero.

"The 'Air Service' is so different from the 'Sea Service' and the 'Land Service,' that it requires very different treatment.

"Men brought up in the other two services have to begin at the lowest round of the ladder before their education is complete for the navigation of the air.

"The importance of gaining the mastery of the air is now recognized by all military authorities.

"No Krupp gun can fire with any degree of precision, till the aeroplane gives it, by wireless, the range and the distance.

"No submarine can operate at sea if you have a preponderance of aeroplanes patrolling the sky.

"Lord Kitchener, before his death, stated that 'One aeroplane is worth an entire army corps,' and a member of Parliament recently said that the 'Air Service' of England was destined to be of greater importance than its navy.

"Our own Congress is going to be asked, and I have no doubt will give, the enormous sum of one billion dollars, in order to bring this war to an immediate and victorious end.

"Does not this important service deserve a new Cabinet Officer in Washington? 'The Secretary of The Air Service' to manage it.

"France had this one head five years ago, and England followed suit last year, in separating the 'Air Service' from both the army and navy.

"The press and the people seem thoroughly aroused to the appointing of this new Cabinet Officer.

"Major General Branker, Controller General of Equipment of the British 'Air Service,' made a powerful appeal recently for America not to fall into the error that England did in delaying the appointing of a centralized authority for this great service.

"Last Thursday, Senator Harry New of Indiana, a member of the Air Craft Investigating Committee of the Senate, gave notice that with the opening of Congress it was his intention to submit a bill, authorizing the appointment of the 'Secretary of Aeronautics.'

"In order to pass this bill, it will be necessary to bring to the attention of all members of Congress its vital importance.

"All the men in the Naval Service, who have the welfare of their country at heart, can do much by writing home and getting their influentian friends interested in the success of this bill.

"HUGH L. WILLOUGHBY,"
"Aeronautic Engineer."

Aircraft Resources Low

An extract from a captured German document, given herewith, is interesting.

The order is frank in explaining that, because of the reduced German strength, it frequently will be impossible to hold continuous trench lines, and recommends instead the creation of centers of resistance.

The document warns commanders that should the enemy obtain a foothold within the German lines they must consider carefully whether a counter attack is necessary or worth risking a large number of lives.

Another captured order informs the German regiments that they must provide their own defenses from low-flying Allied aeroplanes, as the German aircraft resources are so low that they cannot be expected to fight off the enemy while they are being engaged "on reconnaissance work." This order adds that complaints from units harassed by low-flying Allied planes will not be forwarded.

Aero Mail Head Thanks Hylan

Writing to Mayor Hylan on Aug. 12th, announcing that the operation of the aero mail service had been taken over from the military aviators by the Post Office Department, Benjamin B. Lipsner, superintendent of the Division of Aerial Mail Service, thanked him and patrons of the service here for their encouragement.

"The great city of New York has been brought closer to the national capital in point of time," he said, "and I believe closer in the matter of interest, by that speedy communication which accelerates business activity."

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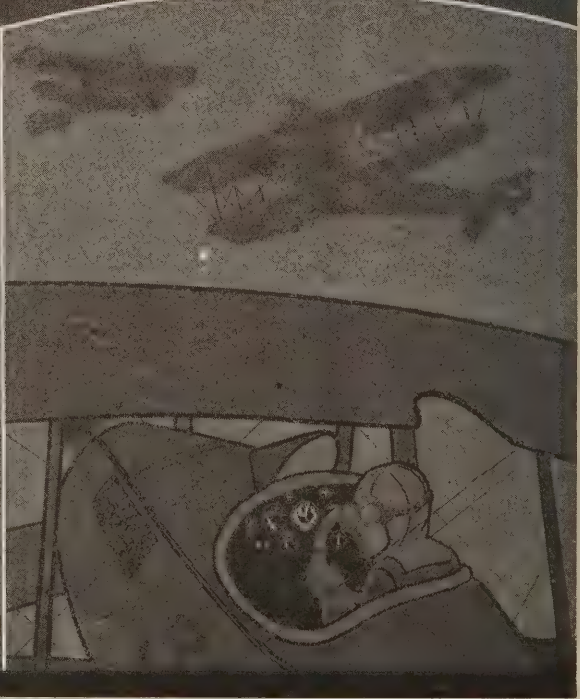

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Two Hundred Pounds of Aerial Mail Costs Only 50 Cents a Mile

About 50 cents per mile is the estimated cost by the Post Office Department of operating the Air Mail Service, according to the *Army and Navy Journal*. The total of all operating expenses of nine aeroplanes covering flights aggregating 7,234 miles was $3,682. The total consumption of gasolene representing 113 hours and 8 minutes of flying was 1,377 gallons, which is $32.50 per hour—something over 50 cents per mile. The total cost of gasolene was $405 in flying 7,234 miles.

The best performance in flying was made by a Curtiss J-N-4 machine, which flew 26 hours and 40 minutes at a coset of $28.01 an hour and covered 1,719 miles at a cost of 43½ cents per mile. A plane equipped with a Hispano-Suiza 150 horse-power engine used approximately eight gallons of gasolene per hour, and a plane equipped with a 400 horse-power Liberty motor used seventeen gallons per hour. This shows 48 per cent. less consumed than generally required for aeroplone engines of these sizes. The average consumption of gasolene for the nine planes was twelve gallons per hour.

Weekly Aero Mail in Canada

Toronto.—It is probable that the aerial mail route started Aug. 16 between Ottawa and Toronto will be maintained as a regular weekly service.

Seven Hun Aviators Buried By Americans

With the British Armies at the Front, Aug. 12.—American soldiers buried seven dead German airmen in a great hole made by a bursting bomb on a giant aeroplane the Germans sent over in the night for the purpose of bombing the British line of communications. This second hostile leviathan of the air descended during the battle and was caught in the rays of a searchlight north of Amiens and was brought down by the British.

It measured 135 feet spread and was provided with five motors, developing more than 1,500 horsepower, but with an estimated speed of only about sixty-five miles an hour. One of the big bombs it carried was either released just before the machine crashed or burst as a result of the fire when the machine struck the ground.

The Americans arrived on the scene soon after and interred the dead Germans in the hole they had made for themselves.

(*Contnued from page* 1180)

be cut. While one set of blanks is being cut, those on the other table are being mounted so that the machine is constantly in action and is not stopped for loading or unloading.

When a cut has run out the table is quickly detached from the drive mechanism by pressing a lever and this table is pushed out of the operating range through the housings either backward or forward as the case may be) to make room for the other table on which a model and a set of blanks have previously been mounted and are now ready for cutting.

As the work table travels back and forth under the fulcrum arm carrying the tracer and the cutters which is free to swing up and down in a vertical plane, the tracer follows the undulations of the model causing the arm to swing correspondingly, so that the cutters reproduce in the wood the exact shape of the model, there being just enough weight on the arm to keep the tracer in contact with the model.

Quality of Product

The fundamental principle embodied in the design of this machine makes it possible to obtain a degree of accuracy far beyond the possibilities of most of the various types of machines now in use. The fact that, on the one hand, cutters and tracers are held on the same member. while, on the other hand, model and work are mounted on same table, not only makes it possible to obtain the greatest accuracy but enables much heavier cutting than would otherwise be possible. By cutting both ends from the same half model, a close approach to a perfect balance is obtained.

The shaping can be held very close to the finished dimensions and the surface left by the specially designed cutters, traveling at a high speed, is so smooth that no spoke shaving is required. The sanding, etc., required should not average more than about two hours on a propeller 8′ x 8″.

Uniform thickness is secured by very simple and convenient method of supporting the work.

The machine is capable of taking four of the training propellers of the Curtiss 8′ type simultaneously or two of the large types. The total time taken for two cuts—roughing and finishing—is forty-eight minutes which would make an average of twelve minutes per propeller when four are cut at once.

Four blade propellers can be handled as practically as two blade.

Operation:

The operation is extremely simple, every provision having been made to eliminate the need of any special skill on the part of the operator.

Before mounting, the laminated blanks should be accurately bored and faced parallel so that the hub is of correct thickness to begin with. The blanks are locked in correct position on special fixtures and are held rigidly in position at the hub by means of nuts; two quickly adjustable stops are brought up to the underside at the end of each blank.

A pneumatic chuck or suction device, securing and releasing instantaneously, is located between the stops and holds each blank firmly in the correct position during the cutting, eliminating the need of clamping mechanisms which might have a tendency to spring or distort the blank.

It has been found practical to machine rough blanks in one cut down to the finished size. If it is desired to have the propeller seasoned between the roughing and finishing cut, the practice is to rough cut a quantity down to about ¼″ of the finished thickness and eventually return them to the machine, mounting them on the fixture as before and making a finished cut to size. In that case the roughing cut may be taken at the full feeding capacity of the machine, the finishing cut being run at a finer feed.

Grinding Cutters:

The importance of correctly and nicely ground cutters being realized, a special motor driven grinder is furnished with the equipment arranged for handling the cutter blades in the simplest manner.

Models are made of hard wood and cut on the machine from a propeller which is considered correct.

Design and Construction:

The machine is well supported on heavy beams on which are mounted, planed and leveled heavy steel rails.

Cutters are readily ground to size in grinder supplied with machine. These are designed with a view to economy and speed in producing them. The blades are inexpensive to make and can be produced with a very small machine shop equipment. They run at 7,500 R.P.M.

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AERIAL AGE
WEEKLY

Vol. 7, No. 25 SEPTEMBER 2, 1918 10 CENTS A COPY

Patroling seaplane working with one of the Allied navies

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When you finish reading this issue place a one-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed over-seas.
NO WRAPPING — NO ADDRESS
A. S. Burleson, Postmaster-General

Second Assistant Secretary of War John D. Ryan Given Full Charge of Aircraft Work

Complete Report of Senate Sub-Committee

WHEN THE GLORIOVS DAWN OF VICTORY COMES AND THE TRVE STORY OF THE WAR CAN BE TOLD, IT WILL BE FOVND THAT CVRTISS AEROPLANES AND CVRTISS MEN HAVE "DONE THEIR BIT."

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SECOND ASSISTANT SECRETARY OF WAR, JOHN D. RYAN, GIVEN FULL CHARGE OVER ALL AIRCRAFT WORK

On August 27, Secretary of War Baker announced the appointment of John D. Ryan as Second Assistant Secretary of War to have full charge of all aircraft work.

The text of Secretary Baker's announcement was as follows:

With the concurrence of the President, I have today selected John D. Ryan to act as Second Assistant Secretary of War in the place of Edward R. Stettinius, who is now in France. Mr. Stettinius will continue the special representative of the War Department in France, with full power to carry out special missions with which he is charged, and will exercise as such special representative all the powers he has hertofore had.

John D. Ryan, as Second Assistant Secretary, is designated Director of Air Service and is charged with the responsibility of procuring and furnishing to the army in the field all material and personnel required for the air service, and is given supervision, control, and direction over the Bureau of Aircraft Production and the Bureau of Military Aeronautics, with full power completely to co-ordinate their activities and to develop and carry out the air program. Mr. Ryan will select a new head for the Bureau of Aircraft Production.

Benedict C. Crowell, First Assistant Secretary of War, is specially intrusted with the responsibility for the munitions program, and as Director of Munitions is given the necessary power to see that the munitions required for our military operations are procured and furnished to the army in the field.

Mr. Keppel retains the duties heretofore assigned him.

The new relation assumed by Mr. Stettinius is in pursuance of a plan fully discussed with him before he went to Europe and with which he is in full accord.

AIRCRAFT PRODUCTION IN THE UNITED STATES

Complete Report of Subcommittee on Military Affairs

Mr. THOMAS, from the subcommittee, submitted the following report to the Committee on Military Affairs:

The subcommittee on Military Affairs, who were directed by the chairman of the committee, pursuant to a Senate resolution adopted April 30, 1917, to investigate aircraft production in the United States, have completed the duty assigned and report as follows:

TO THE SENATE COMMITTEE ON MILITARY AFFAIRS:

On April 6, 1917, the United States entered the war.

On June 8, 1917, public announcement was made that a great fleet of 25,000 aeroplanes was about to be created, and would be decisive of the war months before an effective army could be put in Europe.

July 24, 1917, Congress appropriated $640,000,000 to carry out the aircraft program. This fund has been, either by actual expenditure or by commitments, exhausted. A further appropriation of $884,304,758 has been found necessary.

In the opinion of the committee a substantial part of the first appropriation was practically wasted.

While much good work has been accomplished, for which due credit should be given, it must nevertheless be admitted that our aeroplane program has, up to the present, presented many aspects of failure. To some of these we call attention:

While an army of three and one-half million has been raised, the aircraft situation is as follows:

(*a*) Six hundred and one De Haviland 4's have been embarked for France up to August 1, 1918.

Of these, 67 had reached the front by July 1.

On August 7 a squadron of 18 De Haviland 4's flew over the German lines. Details of its performance have not been received.

The character and construction of the De Haviland 4 is further discussed in paragraph (*i*) and in the body of this report.

(*b*) We have not a single American-made Chasse (or plane of attack) upon the battle front.

(*c*) We have not a single American-made heavy bombing plane upon the battle front.

(*d*) We have not developed and put in quantity production a successful Chasse, or fighting plane.

(*e*) Our attempt to create a fighting plane was centered in an attempt to adapt the Bristol Fighter and De Haviland to the Liberty motor. The Bristol was, without sufficient tests, put in quantity production, over $6,500,000 expended, and the lives of several gallant men sacrificed, when the machine was condemned and its manufacture discontinued.

(*f*) The Standard J training machine was equipped with the Hall-Scott engine and put in quantity production. After more than 1,200 had been manufactured at a cost of $6,000,000, the machine thus equipped was condemned as dangerous and placed in storage.

(*g*) The Spad is a Chasse or fighting plane of the highest type. Early in September an oral order was given to the Curtiss Aircraft Co. for the manufacture of 3,000 of these machines. Work was at once begun and drawings practically completed.

On September 27, 1917, Col. Clark and Maj. Vincent (one of the inventors of the Liberty motor), concluded that the machine could not be operated with a Liberty motor.

October 8 the contract was canceled, the reason given being that the single-seat fighter was regarded as obsolete. But the fact is that on April 23, 1918, a contract was let to the Curtiss Co. to build 1,000 single-seat fighters, known as the S. E. 5, which is the English equivalent of the French Spad.

In addition to this, our Government is now using upon the battle front every Spad machine it can secure from the French, but has only been able to obtain about 418 of them.

(*i*) The cancellation of the Spad contract and the failure of the Bristol left us without either a single or a two seat fighter. Except the De Haviland 4, which was originally designed as a two-seat fighter and which we are equipping for reconnaissance, photographic, bombing, and fighting purposes.

Contracts for 8,500 were let at various times. Up to August 1, 1,000 had been delivered, and a number forwarded to Gen. Pershing. An inspection and test developed numerous mistakes, both in design and workmanship. Work upon the planes was stopped until the defects could be remedied. In part this appears to have been accomplished in the field, for a squadron of 18 planes has been sent across the German lines.

(*k*) As early as the month of October, 1917, we were in possession of the necessary facilities to construct the Caproni, a powerful and successful heavy bombing plane, approved both by Italian and English aeronautical engineers.

Expert Italian engineers have been upon the ground since the month of January, yet the fact remains that we have up to date constructed only one experimental machine which is equipped with Liberty motors.

Nearly a year has elapsed since we might have begun work upon these machines and by this time have been in quantity production.

(*l*) The Handley Page heavy bombing machine furnishes another example of delay. Plans were furnished the Signal Corps in the summer of 1917, but were not then availed of. Contracts for spare parts were not made until February, 1918. Deliveries of these spare parts did not begin until August, 1918. A sample plane ordered in March, 1918, was flown last July. Tests are not yet complete.

In the opinion of the committee the disappointing results above set forth are chiefly due to three causes:

1. That the aeroplane program was largely placed in the control of great automobile and other manufacturers, who were ignorant of aeronautical problems.

II. These manufacturers undertook the impossible task of creating a motor which could be adapted to all classes of flying craft. It is not too much to say that our airplane program has been largely subordinated to the Liberty motor.

III. We failed at the beginning of the war to adopt the commonsense course of reproducing the most approved types of European machines in as great numbers as possible. This should have been carried on coincident with the production of the Liberty motor. This sound policy has very recently, but after a lamentable lapse of time, been adopted.

The mistakes and errors referred to would probably have been largely avoided if the aircraft program had been under the control of one man, assisted by skilled aeronautical engineers and practical flyers to design and test our machines, with production made subordinate to them.

This brief summary is not a wholesale condemnation of our aircraft program. Much has been accomplished. The committee is glad to report that while it believes there are yet many things to be remedied, nevertheless we are approaching a period when quantity production of planes may soon be hoped for.

The committee further reports in detail:

Beginning on May 29, your committee, instructed to inquire into the causes of delay in aircraft production, visited a number of training and testing fields and manufacturing plants in different sections of the country. It has since examined many witnesses, comprising manufacturers, fliers, officers, inspectors, and men more or less familiar with the subject and interested in the solution of its problems. The committee has not exhausted all sources of information, to do which would require the remainder of the session, but it received statements and heard testimony upon many features of the question. No attempt has been made to investigate charges of personal dishonesty or official corruption. That subject more properly belongs to the Department of Justice, which, under the direction of Hon. Charles E. Hughes, has been conducting an inquiry of its own regarding that and other phases of the subject.

In directing attention to conditions, both past and present, in the aircraft administration, your committee realizes that it is easier to criticize than to construct, and that due allowance should be made for mistakes of judgment, which are unavoidable in the organization of a new branch of the service, involving the establishment of an extensive industry. Our inquiry has been as impersonal as these conditions have permitted, and it is in the same spirit that this report is made.

The Aircraft Board

As originally composed, representatives of the automobile industry featured this organization, presumably due to the theory that aircraft engine and plane production were analogous pursuits. The latter was therefore submitted to the custody of men skilled in automobile production. A board thus equipped naturally depended upon motor-car engineers and manufacturers for the solution of aviation problems. But the analogy between the two pursuits virtually begins and ends with the fact that each uses a gas-explosive motor. Hence difficulties in design and production would tend to increase until such conditions were recognized. This fact must have been demonstrated to the board through its initial experiences, for Maj. Downey states that in the beginning the board wanted much authority with little responsibility.

"They wanted the Signal Corps to execute contracts and stand back of them, the board to be in an advisory capacity, and still control the situation."

Later, when—"They saw the crash coming the board passed a resolution reaffirming the fact that they were only acting in an advisory capacity."

Organization under the Aircraft Board was unsystematic and ineffective. The chief officer of the Signal Corps was the nominal head, under whose ostensible supervision bureaus of engineering, equipment, supplies, lubrication, production, etc., were established, many of whose functions ill defined, conflicted with, or overlapped each other. Contractors, inventors, material men, everyone having business with this arm of the service and directed from one official to the other could not well transact their business and secure results with directness and efficiency. While this condition seems to be inseparable from official business routine in Washington, it featured largely in aviation from the start, materially hindering production on the one hand and diffusing responsibility therefor upon the other. Fairness, however, requires the statement that the identification by Congress of aircraft production and administration with the Signal Corps was unfortunate. The primary needs and importance of that corps as then defined were fully equal to the experience and efficiency of its commanding officer.

Aircraft Program

When Italy entered the war she made a careful study of aerial warfare upon the French front as then developed. Her engineers then selected the most efficient types of French flying planes and immediately put them into production under the supervision of skilled French artificers. Coincident with this policy she began the development of airplanes on her own account. Her armies were, therefore, rapidly equipped with an excellent service, afterwards supplemented by machines equally effective, but of Italian design and driven by Italian motors. By this means she avoided delay in production. She also promoted the development of her engineering genius by employing it under practical conditions upon the front with the best machines that France had produced.

Your committee does not understand why the Aircraft Board did not adopt this obviously essential policy. The Signal Corps dispatched a commission to the front, headed by Col. Bolling, instructed to secure all needed information, evidently for that purpose. Col. V. E. Clarke, the aeronautical engineer of the commission, made an elaborate report, having Col. Bolling's approval, recommending the production of three English, two French, and one Italian plane, but the report was not heeded. Designs for these and other types were placed by the allied Governments, or by the inventors themselves, at the board's disposal, with assurances of expert aid to their vigorous construction.

An ostensible reason assigned for the board's inaction was the difficulty of translating metrical into linear measurements, and of obtaining quantity production of foreign motors. But the tardy acceptance and manufacture of some of the models and designs revealed the imaginary character of this objection. The board took some of the planes placed at its disposal and attempted with ill success to materially change them for American production. The general purpose of the changes seems to have been designed to adapt them to the Liberty motor, but this normal action should have been paralleled by their manufacture, both as to plane and engine, in strict accord with the plans as submitted.

Ultimately, and in the autumn of 1917, the board adopted one French and two English types of fighting planes to carry the Liberty engine. These were the Spad, the Bristol, and the De Haviland 4. Col. Clarke was instructed to redesign the Bristol upon the English model, retaining its wing load of about 7.1 pounds in a total weight of 2,937 pounds.

Hundreds of changes afterwards made in this design by Signal Corps and production engineers without consulting Col. Clarke increased the wing load to about 9.2 pounds per foot, with an approximate weight of 3,700 pounds. Some of these changes were required by the increased strain of the heavier and stronger motor upon the structure. The machine was finally put into production and then abandoned after the test of July last, and after an expenditure of more than $6,500,000 and the loss of several valuable lives.

The overload placed too great a strain upon the wings, and this, with bad construction, compelled the board to stop production. The money loss may be partly covered by salvage. The loss of life and of months of precious time through the needs of substituting another type of plane for the Bristol and then producing it are matters of serious concern.

In September, 1917, the Signal Corps contracted with the Curtiss Co. for 3,000 one-seater Spad planes. This is an excellent French biplane, then and now in use on the front. In October the contract was canceled, the reason given therefor being that it was done at the direction of Gen. Pershing. Inasmuch, however, as Gen. Pershing's cablegram concerning the subject bears the date of December 14 following, we must accept the statement of the Curtiss Co.'s officials that the board canceled the contract because it desired to equip the plane only with the Liberty eight-cylinder motor, which was found impracticable. The Liberty 8 was about that time discarded.

The plane was too light for the Liberty engine, so its production was suspended. The French use the Hispano-Suiza motor with this plane, and the Curtiss people assure us that their contract would long ago have been completed and the planes in the service at the front had the manufacturers been permitted to proceed with production. No attempt was thereafter made to manufacure single-seater fighters, ostensibly because of the Pershing cablegram, until May last, when Mr. Ryan placed an order with the same company for 1,000 SE5 planes. This is substantially the English equivalent of the Spad and will probably be in production during the coming autumn. It is manifest that if the manufacture of the SE5 is proper at this time, then the discontinuance of the manufacture of the Spad was a mistake, regardless of who is responsible therefor

The plans for the Caproni and the Handley Page bombing machines were available to the board soon after our entry into the war.

Early in the summer of 1917 the Standard Aircraft Co. was instructed to hold their plant at Elizabeth, N. J., in readiness to build Caproni planes.

About September 15, a verbal contract was made with the Curtiss Co., formally confirmed on October 8, 1917, to build 500 Caproni planes. This contract was never carried out, because no information was furnishes to the Curtiss Co., although they repeatedly endeavored to secure the same. Afterwards it was canceled, and contract for the Bristol Fighter was substituted.

(*Continued on page* 1235)

THE NEWS OF THE WEEK

U. S. Fliers Downed 76 Planes to Aug. 1

Statistics covering the activities of the first American pursuit group of aviators up to August 1, comprising only four of the American squadrons now in operation, show in a striking way the strides made by American aviators since the United States entered the war.

The figures show that no fewer than fifty-eight aviators are officially credited with downing anywhere from one to five planes. Seventeen machines are credited to the late Raoul Lufbery.

In actual numbers the German machines downed total fifty-nine, exclusive of those of Lufbery, but they are divided officially among nearly twice that number of men, because on numerous occasions several fliers participated in a battle.

The aviators with five victories each are Lieuts. Campbell, Rickenbacher, MacArthur and O'Neill. Those with four each are Capt. Peterson and Lieut. Meissner. Those with three each are Lieuts. Mitchel, O. P. Porter, Simonds, Jones and Healy.

Fourteen others have two victories each, and thirty-two more, including the late Lieut. Quentin Roosevelt, are credited with one each.

These figures do not include the records of other squadrons, which have been even more successful.

American Airmen to be Given More Instruction In Gunnery

The War Department authorizes the following:

For the extension if instruction in gunnery and in order that more fliers may be trained on this side of the Atlantic, the Division of Military Aeronautics, on approval of the Secretary of War, is now leasing land for target practice near the larger flying fields. A tract of 10,000 acres has just been leased outside of Fort Worth, Tex., and not far from Taliaferro, Barron, and Carruthers Fields.

Within a few miles of Hazelhurst Field, Mineola, Long Island, and fronting on the south shore, another tract of 750 acres has been leased at Wantagh, known as Lufbery Field, and additional marshy land is being secured. A piece of 50½ acres, adjoining Mineola Field, and formerly occupied by hucksters' stands and shanties, has been leased and has been leveled for a drill and exercise ground.

Balloon Observers Needed

The Division of Military Aeronautics is in need of several hundred young men between the ages of twenty-five and thirty-five years for duty as balloon observers. The candidate should have a technical training that will help him to read maps and photographs of the terrain and to calculate distances and angles. The Division of Aeronautics sends the successful applicants to one of its training schools, of which it has five—at Arcadia, Cal.; Fort Omaha, Nebr.; John A. Wise, San Antonio; Lee Hall, Va., and Fort Sill, Okla., the last two being the schools where the candidates get practice in connection with the Artillery camps in those places. The candidates, upon completion of their course, receive commission as second lieutenants, and are sent abroad for further education.

Air Hero of Italy in U. S.

An Atlantic Port.—A French steamship arriving at this port on August 22 brought many notable military and civil officials among its 210 passengers. On of the passenger list was Lieut. Parvis, Italy's foremost air fighter.

Lieutenant Parvis, Italy's air hero, comes to the United States to carry on the work begun by the late Capt. Resnati, who was killed in a fall on Long Island early in the summer. On an Italian steamiship Lieut. Parvis is bringing a Caproni triplane, in which he expects to install three Liberty motors to demonstrate the effectiveness of the American air engine in heavy bombing planes.

Lieut. Blair Thaw is Killed by Fall

With the American Army in France.—Lieut. Blair Thaw of Pittsburg, a member of the American aviation service, was killed on August 18.

His aeroplane fell as a result of engine trouble.

Lieut. Thaw was travelling in a pursuit group near the front toward Paris. The engine trouble developed at an altitude of 2,000 feet, and the machine, when it fell, struck a number of telephone wires and collapsed, upside down. Thaw was instantly killed and his companion aviator was badly injured.

Thaw, although less well known than his brother, had just been promoted to command a flying squadron and was on his way to take over the squadron when he fell to his death. His body was taken to an evacuation hospital, where impressive funeral services were held.

Lieut.-Col. Harry W. Gregg, the officer in charge of the Aviation Concentration Camp at Garden City, Long Island

Safeguard Cologne Museum Collections

Washington. — An official dispatch from Switzerland says that the art collections in the museums at Cologne are to be taken to Cassel and Brunswick to be out of danger from Allied aerial bombardments. The German newspapers are asking that the treasures in the Munich museums be similarly safeguarded.

Official War Photographs

A catalogue of the official war pictures collected by the picture division of the Committee on Public Information has just been issued and is ready for distribution to the public. The "official" pictures listed in the catalogue include photographs taken by the Signal Corps of the Army, the Navy, Marine Corps, and other branches of the American service, and also photographs taken by the French and Belgian Governments. Photographic prints of the pictures on heavy paper and ready for framing or insertion in albums are now on sale at 10 cents each. Stereopticon slides of finest workmanship, standard size, and suitable for the use of teachers and lecturers, are for sale by the committee at 15 cents each.

For further information in regard to these photographs address the Division of Pictures, Committee on Public Information, 10 Jackson Place, Washington, D. C.

New Fast Aeroplane Sent Out by Enemy

Paris, August 18.—French aviation circles report the appearance of the western front of a new German chasing aeroplane, the Siemens-Schuckert biplane.

This machine has an eleven cylinder engine of the same name, which developes 260 horse power and drives a four-bladed propeller. The plane carries two machine guns, which are simultaneously or separately through the propeller. It is extremely rapid and easily handled.

Calls 253 for Air Service

Washington.—Provost Marshal General Crowder issued a call on August 17 for 253 men for limited service in the military aeronautic division of the army. These men will mobilize at Madison Barracks, Sacketts Harbor, N. Y., on August 29, from eighteen States, as follows:

Connecticut, 10; Delaware, 3; Georgia, 5; Illinois, 25; Indiana, 15; Maine, 5; Maryland, 5; Massachusetts, 20; Michigan, 20; Minnesota, 10; Missouri, 10; New Hampshire, 5; New Jersey, 20; New York, 40; Ohio, 25; Pennsylvania, 25; Rhode Island, 5, and West Virginia, 5.

Planes for Museums

Melbourne.—The Australian Government has planned the establishment of war museums in Australia after the war for the exhibition of trophies and relics. Among these are to figure enemy aeroplanes which are captured without being totally destroyed by the Australian flying corps.

Such wrecked machines are, of course, thoroughly inspected by the technical department of the Royal Air Force for examination of German devices and German adaptation of British devices. They are eventually handed over to the Australian Government, to take their place along with other trophies won by the Australian forces.

U. S. Flyers Join in Raid

London.—American naval flyers participated in the air raid August 15, when Allied aviators bombed Ostend. Further activities against submarine bases along the Flanders coast are expected. The night bombing expedition was regarded as particularly successful.

Several seaplanes, equipped with Liberty motors, have been with the American fleet for months. The bombing type of plane, which carries eight machine guns, has proved satisfactory in all tests, it was said in British naval circles.

Commend U. S. Flyer

A special report from the commander of a British aero squadron in which Lieut. Edmund G. Chamberlain of San Antonio, Tex., is commended for excellent service in bombing raids, has been received by the Navy Department. The communication shows that the naval flyer took part in fifteen air raids from June 20 to July 13.

Lieut. Chamberlain is mentioned in the British report as having participated in the attacks on Zeebrugge harbor and canal and the Bruges docks.

Air Mail to Athens

Paris.—An air mail service between Athens and Saloniki will be inaugurated this week. The "air post" will give a daily service between the two cities and at a cost of only 6 cents a letter.

Aero Office Needs Typists

Stenographers and typists are needed for the office of the Director of Military Aeronautics in Washington, and there is an immediate chance to get into this most interesting branch of the military service. Capt. D. B. Lawrence of the Aviation Service is on duty at the office of the Air Service Officer, 104 Broad street, where applicants will be interviewed at any time. Stenographers and typists in the Air Service are paid at the rate of $1,100 to start. At the end of three months his salary is automatically increased to $1,200, and there are good opportunities for advancement to higher salaried positions. Special arrangements have been made with the civil service to give prompt examination to all applicants, and those who pass the civil service test can be certified for service within a few days.

Rooming conditions in Washington are very much improved, and the Council of Defence in that city will see that every employee gets a choice of rooms. The new Government buildings for civilian employees will be ready about December 1 and will provide rooms and board for 5,000 employees at very low rates.

"Cartwheeling" is one of the simple tricks performed by military fliers. The pilot stands the machine on its tail, and by certain movements of controls makes it drop sideways, so that as its nose falls the craft comes out in the opposite direction to that which it was flying originally.

Noted German Fliers Killed

Washington.—Thirteen of Germany's leading aviators have been listed as missing in action since July 1, according to an official despatch from France, received here on August 17. The aviators who have been thus listed and the number of Allied machines with which they were credited with bringing down are: Leo Wernhardt, fifty-three; Menshkoff, thirty-nine; Bongartz and Buckler, thirty-three each; Billik, thirty-one; Wuesthoff, twenty-six; Von Turcheck, twenty-seven; Kirchsteiner, twenty-seven; Puetter, twenty-five; Winisch, Fredericks and Pipphardt, twenty-one each, and Richardt, twenty.

The German high command, while sparing of planes, the despatch says, has been most prodigal in the exposure of pilots.

German Aviators Using Parachutes

British Headquarters in France.—It is said that some German airmen are now using aeroplane parachutes with apparent success. On August 14 a Fokker biplane was seen to emit smoke while at a great height, burst into flames and dive. A parachute was noticed to open suddenly in the considerable wind pressure caused by the dive, and drag the pilot clear of the machine. Another Fokker brought down the same day was similarly fitted.

Our Airmen Win Fight

With the American Forces in France.—Two bombing flights were carried out on August 19 by American aviators on the towns of Longuyon and Audun-le-Roman, northeast of Verdun. Bombs were successfully dropped on railroad tracks and roundhouses.

Three American reconnoissance planes encountered and attacked three German machines near Wavrille, to the north of Verdun. One German aeroplane was forced down with its tank on fire and the others were driven away. The Americans returned to their bases safely.

Another reconnoissance formation met six Rumpler monoplanes near Thiancourt. Three of the German aeroplanes attacked Lieut. Urband, who was taking photographs. The Lieutenant opened fire and hit one German machine, which spiraled sharply downward and disappeared at 11,000 feet.

Son's Record is Sent to Roosevelt

Col. Theodore Roosevelt has received a letter from Gen. Pershing, in which he said:

"Quentin died as he had lived and served—nobly and unselfishly—in the full strength and vigor of his youth, fighting the enemy in clean combat. You may well be proud of your gift to the Nation in his supreme sacrifice.

"Inclosed is a copy of his official record in the air service. The brevity and curtness of the official words paint clearly the picture of his service, which was an honor to all of us."

The record says Lieut. Roosevelt entered the service August 8, 1917, and then gives his assignments up to the time of his death, July 17, 1918. Continuing it reads:

"Lieut. Quentin Roosevelt, during his whole career in the air service, both as a cadet and as a flying officer, was a model of the best type of young American manhood. He was most courteous in his conduct, clean in his private life and devoted in his duty.

"After completion of his training as a pilot, he was selected on account of his efficiency as an instructor and had charge of one of the most important flying instruction fields. His great desire and hope was to get to the front. This opportunity was not practicable for a comparatively long time on account of his expert services being more needed as an instructor.

"When the order assigning him to duty with a squadron finally came on June 24, he lost no time in reporting and arrived just in time to take part in the last great enemy offensive where the combat work by his squadron was most strenuous and aided materially in the success of the battle.

"Lieut. Roosevelt had already brought down one enemy plane and had aided the squadron in a number of flights against large enemy air formations, where the American units dispersed the enemy and brought down a number of their aircraft. His work durinng the combats was exceptionally good, his endeavor being the success of the squadron rather than to get individual aeroplanes to his personal credit.

"His loss was deeply felt by his flying comrades in the squadron, as well as by all officers and soldiers with whom he had ever come in contact."

This record was made by Col. R. O. Vanhorn of the Air Service.

Lieut. Earl Carrol—the Composer—Aviator of the U. S. Air Service

Aeronautics in 1783

Secretary of the Aero Club of America,
New York.

Dear Sir:

I believe your society will be interested in the enclosed interesting note relative to the history of the aeroplane, which I found recently while looking over a copy of the *Maryland Gazette* for November 14, 1783, under caption "London Notes"—and take pleasure in forwarding it to you.

Sincerely yours,
H. M. NICHOLSON.

291 Quincy St.,
Brooklyn, August 18, 1918.

From *Maryland Gazeztte*
November 14, 1783
"LONDON NOTES"

"The French have generally been famous for invention, the English for improvement:—if, therefore, the former have invented a machine to rise into the atmosphere, the latter may be expected to frame one to mount to the planets."

Lieut. Louis Bennett, Jr., of the British Royal Air Forces

With the American Army in France

With the American Army in France.—Lieut. Henry G. Maclure of Newton, Mass., has been missing since July 15. He was operating a pursuit machine in company with others, protecting observing planes, when he became detached from his squadron and vanished.

With the American Army in France.—An American bombing squadron commanded by Lieut. Gundelach dropped twenty bombs on the railway yards at Conflans on August 15. Eighteen direct hits were observed in the centre of the tracks in the east portion of the yard and two on the roundhouse.

The squadron was pursued by eleven enemy planes, six of which were speedily left behind. One of the remaining five was hit by the American machine gunfire and forced to descend near Joinville. Lieut. Gundelach was slightly wounded.

Our aviators also successfully bombarded the railroad yard at Dommary-Baroncourt, in the Verdun-Metz area. Longuyon, north of Verdun, and Thiaucourt were also attacked.

Several bursts were observed in the central and southern parts of the yard at Dommary-Baroncourt, and the installation there are believed to have been wiped out.

Three direct hits were made on the track in front of the station at Longuyon and twenty-three bombs fell on surrounding warehouses.

During the aerial fighting an American airman attacked a German balloon. His gun jammed when he tried to fire incendiary bullets, but he was able to fire fifty of the other kind. The German aeronaut then jumped with his parachute.

Confirmation has been received of the victory of Lieut. Edgar C. Tobin of San Antonio, Tex., in the air combat on August 10.

With the American Army in France. Lieut. David E. Putnam, of Brookline, Mass., brought down his eleventh enemy machine on August 15.

Four Americans in the morning met four German "Fokkers." Lieut. Drew brought down one of them and Lieut. Stiles another.

Paris, August 16.—Lieut. Walter B. Miller of New York, a former member of the Lafayette escadrille, who was transferred to the American service, was killed in an aerial combat August 3.

His patrol, consisting of eight machines, was attached by a German squadron of thirty aeroplanes. He fell inside the American lines. The other members of the patrol escaped after a fierce struggle.

Headquarters American
Expeditionary Forces,
August 16, 1918.

Section A.—Yesterday in the course of a combat in the region of Flirey our aviators shot down a hostile machine.

The following details of this aerial combat have been reported: "Lieut. Stiles and Lieut. Drew engaged four Fokker biplanes over Fliery on August 15. One of the planes was brought down, Lieut. Stiles and Lieut. Drew being credited equally with the destruction of the machine."

Capt. Biddle Wins Air Fight

Washington.—Capt. Charles J. Biddle of Andalusia, Pa., was the American aviator who brought down a German aeroplane in the Lorraine, mentioned in Gen. Pershing's official communiqué August 17. Additional details are contained in section B of the communiqué for that day, made public today. It follows:

Section B—The following details of the aerial combat referred to in section A have been reported in Lorraine:

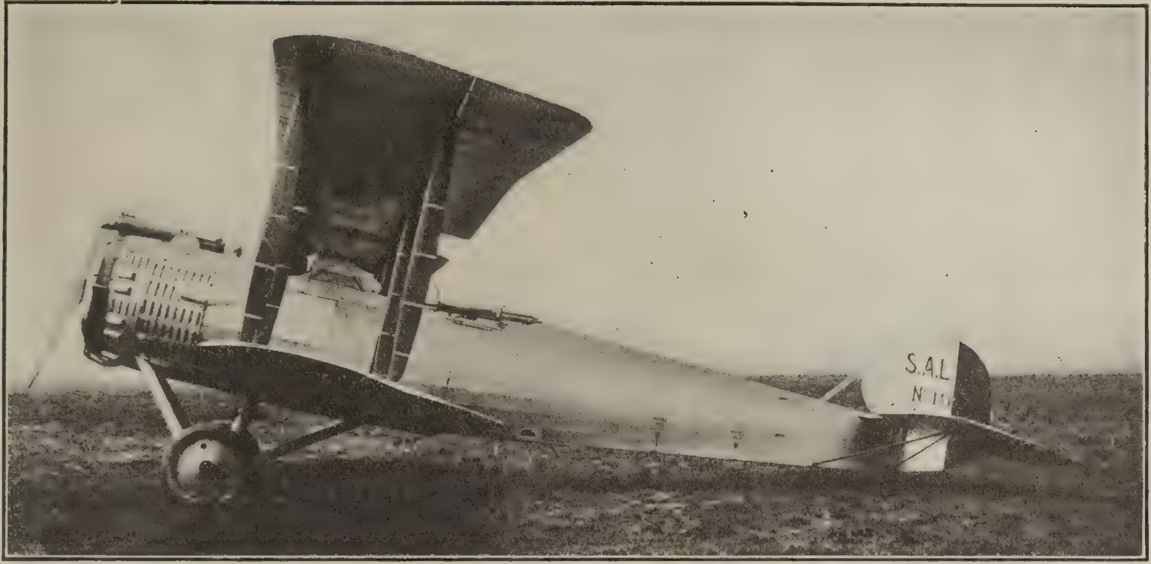
Capt. Biddle brought down a Rumpler machine northwest of Douxieres-aux-Dames at 5:40 o'clock in the afternoon of August 16. The observer was killed and the pilot wounded, but the machine landed intact.

Lieut. Vaughn H. McCormick of Columbus, Ohio, got his second official German aeroplane when he engaged the enemy in the air north of St. Mihiel on August 18. French observers have confirmed the destruction of the German.

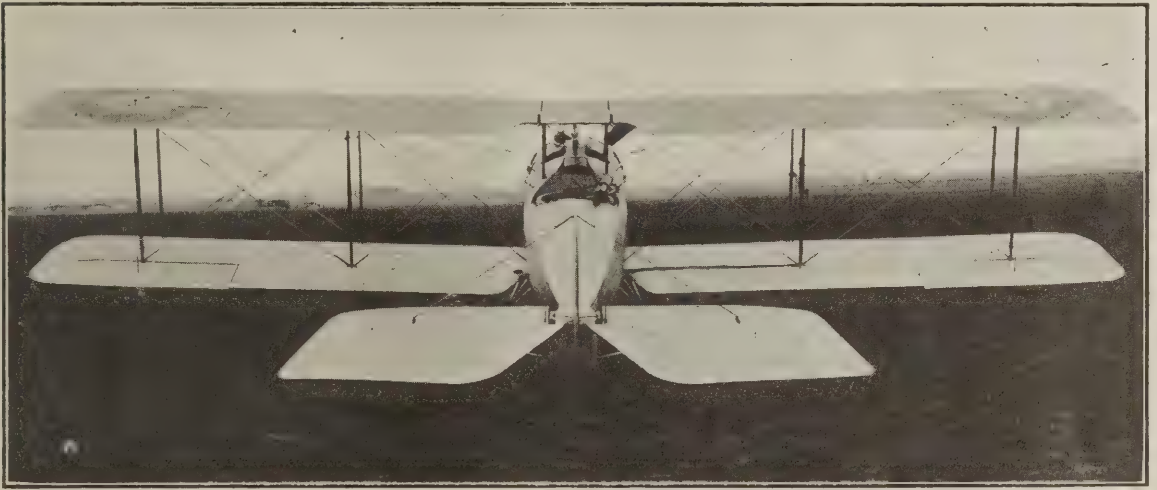
Another enemy machine was shot August 10 by Capt. Ray C. Bridgeman of Lake Forest, Ill., near Xivray, in the destruction of which Lieut. McCormick also shares officially.

Additional American victories in the air include a monoplane apparently shot down by Leut. Hermann Schulz of Bettendorf, Iowa, which went down in a steep dive through the clouds over Flirey, after 375 shots had been fired at it, and a biplane attacked by Lieut. Edgar C. Tobin of San Antonio in the vicinity of Evvezen. Confirmation is being sought for both these victories.

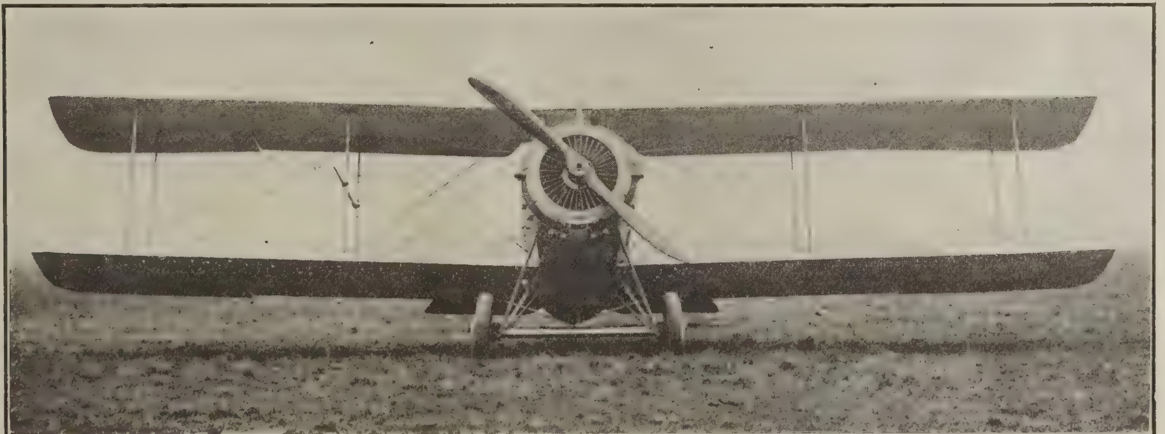
Wednesday was the most active day in the air for some time along the American battle front. One of the American planes attacked a German Rumpler machine. The German disappeared, but apparently was under control. Another American machine forced a German to "run for his life."



Side view of the Salmson biplane



A French Salmson biplane. Two seated, it is used for artillery observation and contact patrol. Some of these machines are being used by the Americans in France at the present time



A Salmson biplane equipped with a 250 H.P. Salmson stationary radial motor

In Recognition of Loyal Service

In conformity with a recommendation of the War Department that faithful service of employees engaged in the manufacture of war materials should be recognized, the American Bronze Corporation, of Berwyn, Pennsylvania, is one of the first concerns in that district to adopt the proposed policy.

Beginning twelve years ago as a modest $5,000 concern, this company has enjoyed a remarkable growth and is now devoting nearly all its output to war purposes. By the American Bronze Corporation's plan of war work recognition each employee is awarded a bronze war worker's badge which, at the expiration of thirty days, will be exchanged for a silver badge, provided the employee has rendered faithful and loyal service. After wearing the silver badge for one month each employee will receive a cash bonus, which will continue for a period of six months, after which he is awarded a gold badge with his name engraved thereon. The gold badge entitled its wearer to the cash bonus during the entire period of his employment, provided he qualifies under the regulations.

The presentation of these badges was made a feature of a "house-warming" held on August 16, in celebration of the opening of the American Bronze Corporation's new plant at Berwyn. The new structure more than triples the former capacity of this rapidly growing concern, and is of the most modern construction and equipment throughout, including a carefully worked out system of routing the work through the plant to insure a maximum of output within a minimum of time.

The exercises began in the afternoon, when the new plant was formally turned over by the contractors and accepted by Mr. M. C. Dittman on behalf of the company, following which Mr. E. G. Anderson gave a talk on the important part their product is taking in the carrying on of the war. Mr. Dittman then explained the bonus plan, after which different department heads were called on for short talks, concluding with an address by Mr. G. D. Porter, representing the stockholders. An election of department representatives closed the afternoon exercises.

The evening festivities began with the playing of the Star Spangled Banner by a band, the selection resolving itself into an accompaniment to the singing of the anthem by the entire gathering. This was followed by a program of vocal and instrumental music, during which Captain Schwab made a short address and distributed the badges. The evening program was given as a "get together" party for the employees and their friends and concluded with dancing and a lavish outlay of refreshments.

Officers of the American Bronze Corporation are John W. Watson, President and General Manager; Matthew C. Dittman, Vice-president and Treasurer; Richard A. Watson, Secretary and Production Manager.

Hall-Scott Supplies Allies

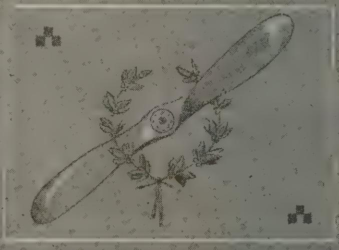
Orders for supplying one of the Allied governments with a number of Hall-Scott L-6a six cylinedr aeroplane engines are being executed by the Hall-Scott Motor Car Company at the West Berkeley, California, plant. This is an improvement over the earlier six cylinder types put out by this company. It is understood the motors are to be used in training planes for advanced students. The rated horsepower is 200 and 1,700 r.p.m. Government testing cards and reports indicate this L-6a type to be of a most advanced type of six cylinder aeroplane engine, and it was largely on the exceptional showing made under government observation that this order was placed. Shipment will be made in the course of a few weeks.

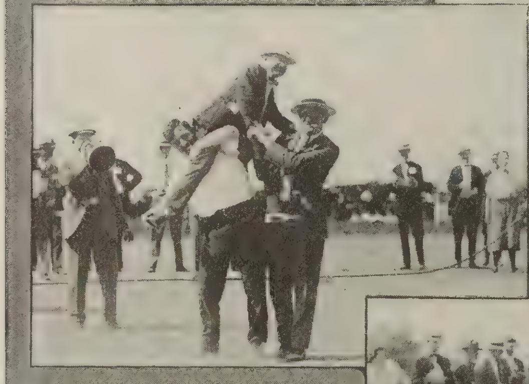
Telepost Explained to Inventors Meet

The mechanism of the Telepost system of automatic rapid telegraphy, invented by Patrick B. Delany, of South Orange, N. J., was explained by H. Lee Sellers, of New York, president of the Telepost Company, to the members of the American Inventors' Association at the Board of Trade rooms.

This remarkable invention has been used in commercial operation between Chicago and St. Louis for over three years. It has a speed of 1,000 words a minute, three times faster than the most rapid speaker, and will work over a telephone circuit with no interference with conversations over the line.

Finish of the 100 yard dash





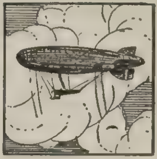
"Doc" Mercer being shouldered by Lewis H. Sullivan, plant works manager (right) and Samuel Cook, Government Approvals Officer, (left)

The start of the 100 yard dash

The Girls' Tug-o-War

Photographs taken at the Field Day and Athletic Meet of the Standard Aircraft Corporation at Elizabeth, N. J., on August third. The prizes were donated by the executives of the company

MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R.F.C., C.F.A.

THE subject of parachute harnesses is one which has been probably as widely discussed among balloonists as any subject relating to the balloon service. Notwithstanding this discussion, there has been no definite agreement reached. There was a type of parachute harness which was regarded as standard and issued as such by the Royal Air Force. This harness, however, did not meet with the unqualified approval of the balloonists in France, so they evolved their own harnesses, which they used in actual practice. They had them made under local arrangements in France.

While a discussion in this column as to whether or not there should be a standardized harness is distinctly out of place, there is this to be said. The balloonist who is making flights every day and who is closest in touch with the practical end of parachute jumping under service conditions, ought, I think, to be consulted as to the harness he shall wear. I do not mean in training, but while he is working in France in the presence of the enemy.

The officer who has accumulated more or less experience in actual balloon work in France will feel much more confident in the efficiency of his harness, if it happens to be one in which he believes. If he does not like a harness, it is dollars to doughnuts that he cannot do his best work while wearing that harness. Therefore, if he likes another harness better, he should be allowed to wear it, if it conforms to the known laws of safety. That is why the British balloonists were provided with a good harness, but were allowed to wear another kind if they liked it better.

To inspire confidence is the first requisite of a harness; that is, providing it is efficient. Whether it is efficient or not can generally be left to the balloonist who is going to use it. The next requisite of a harness is comfort. A pilot or observer spends long hours in the basket of an observation balloon. His harness must be comfortable to enable him to be most efficient. Lightness is a necessary factor in this. A harness which is heavy is going to drag heavily on the shoulders of its wearer. The simpler a harness is, consistent with safety, the better. A complicated harness continually catches on things in the basket, gets in the observer's way at most inopportune times, sometimes reduces him to a state of speechless rage, whereby he is apt to be very impolite to his ground officer and also to his batteries, and a case has been known where an observer was so hampered with his harness that, to be free from its entanglements, he unhooked it, and when it became necessary to parachute he jumped overboard without it, forgetting in the excitement of the moment that he had unhooked it.

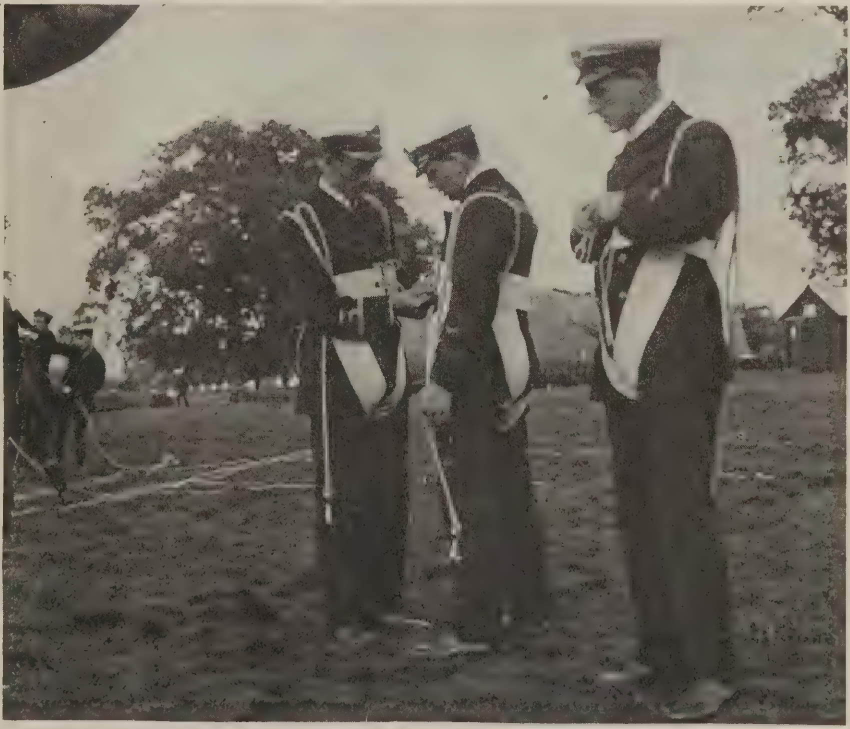
The reference to impoliteness given above may seem a frivolous remark to the average reader. Believe me, it means a good deal more than appears on the surface. The balloons had a very hard time to overcome a whole lot of mistaken prejudice on the part of the artillery against them. A close liason with the artillery is absolutely essential to the best co-operation between the two arms. Poor telephone connections have ruined some very desirable business and social connections even in civil life. The telephones in the army are never as good as might be desired and sometimes cause an even tempered person to exhibit some quite futile temper. Add to a temper somewhat frayed by the difficulties of telephone conversation from a balloon basket, an additional rage caused by a parachute harness getting in the way, and one has all that is necessary to cause a rupture between the artillery and the balloon service. After all, the artillery officers are only human and they think a lot of their arm of the service. I know because I was one of them at one time.

A simple harness has the added advantage that it can be cleared very quickly when occasion demands. When parachuting, an observer has very little time to make up his mind about things. A glance must tell him that his parachute is clear before he goes over the edge. Another desirable point in a harness is that it can be quickly attached and detached from the parachute; sometimes it is just as necessary to get loose from a parachute as it is to be tied to it. In either case the fastening must be absolutely sure.

All harnesses partake, more or less, of the nature of a breeches buoy. Some have bands which fasten tightly just above the knees. This type are apt to restrict the circulation owing to the tightness, and that is not the most pleasant thing in cold weather. On the other hand, if these bands are not fairly tight, in jumping they are apt to be pulled down to the knees and then they suspend the parachutist by the knees, making a decent landing an impossibility. I have seen a type which was very simple, so simple, in fact, that it looked dangerous. However, I have seen it used successfully on more than one occasion in France. It consisted of two loops made in a rope with a small pad on which the observer sat. Fastened to where these two loops joined, and crossing the back of the observer, was a single rope which joined the main suspension over his shoulder.

The majority of harnesses are made of heavy canvas which laces on something the same as a corset. This has two loops of canvas which the legs go through. Light ropes spliced into the top of the canvas suspend the observer from the parachute.

(To be continued)



British Royal Naval Air Service balloonists lacing themselves into their parachute harnesses at one of the Naval training stations. The harness is made of canvas. The harness shown herewith is one which was in common use in 1917. It is a fairly comfortable harness. It laces about the chest and fastens under the shoulder strap of the tunic. The suspension is from the shoulders. Toward the end of 1917 the snaffle hook, which is seen hanging at the end of the suspension ropes, was done away with. The connection with the parachute was then made by a double sheet bend

THE 240 H. P. 8 CYLINDER MERCEDES

Bore 140 m. m.—Stroke 160 m. m.

The following detailed report on the design of the 8-cylinder Mercedes engine is based on an investigation of the engine (No. 23,003) taken from the German two-seater Albatros Biplane (G. 37) which was brought down by anti-aircraft guns near Armentieres on the 12th of May, 1917.

This engine has been tested at the Royal Aircraft Factory and results of B.H.P. developed, petrol and oil consumption, etc., during tests are given herewith, together with details of the engine design and the leading particulars of the engine. Althought this engine, according to reports, is now obsolete, the design having been abandoned in favor of the German standard six-cylinder vertical type, details and illustrations of the engine will no doubt prove of considerable interest, more particularly to those interested in the design of the special engined used for airship work.

In its general details this engine follows closely the design of the 160 H. P. Mercedes engines as regards the construction of the cylinders, pistons, valve gear, etc., and also in the lubrication system. It is therefore very similar to the 160 H.P. engine, with an extra pair of standard cylinders and a massive propeller shaft reduction gear, and the necessary alterations to the design of the crankshaft and the induction system, and in consequence of this similarity in detail to the 160 H.P. Mercedes; it will be unnecessary to deal at any length in this report with the design of those parts of the engine which are identical, a report on the former having already been issued, and the design being now well known in this country.

During calibration tests at the Royal Aircraft Factory, the engine showed a very good general performance, developing a maximum of 286 B.H.P. at 1,750 r.p.m. and an average of 242 B.H.P. at a normal crankshaft speed of 1,350 r.p.m.

Summary of Test

Average petrol consumption per hour	141.3 pints.
Average petrol consumption per B.H.P. hour	582 pints
Average oil consumption	.042 pints/B.H.P. hour.
Oil temperature	37½°C.
Max. B.M.E.P. at 1,100 r.p.m.	120 lbs./sq. in.
Average B.M.E.P. at 1,350 r.p.m.	118 lbs./sq. in.
Compression ratio	4.73 :1

Water pump at normal engine revs. against a pressure of 2 lbs. per sq. in. = 91 gals./min.

The total weight of complete engine, dry including propeller hub and exhaust manifold = 900 lbs., equivalent to 3.72 lbs. per B.H.P.

An attempt was made to throttle the engine below 900 r.p.m., but the running was irregular.

During a power and consumption run of 1 hour's duration an average of 267 B.H.P. was developed, at an average speed of 1,550 r.p.m., and at an average petrol consumption at 155 pints per hour = .582 pints per H.B.P. hour.

Oil consumption = 10.10 pints per hour = .42 pints per B.H.P. hour.

Water temperature, inlet = 65°C; outlet = 78°C.

This test should not, however, be taken as representing the normal performance of the engine, as the average speed at which it was run, namely 1,550 r.p.m. is higher than that which would be obtained for any length of time in the air.

Details of Construction

Cylinders.—These, as already stated, are of the standard 160 H.P. type, and are made entirely of steel, being built up of the top half of the crankchamber, and acting as the loading down bolts for the cylinders.

Following the usual Mercédes practice the crank webs are made slightly heavier in cross section towards the front end of the crankshaft. The external diameter of the crank pins is 55.9 m.m., and the length of the crank pins 70 mm.

The decreasing internal diameters of the hollow crank pins and journals follows the standard Mercédes practice, the holes bored in the rear end crank pins and journals being 40 mm., whereas the internal diameters of the crank pins and journals are gradually reduced throughout the length of the crankshaft to 22 mm. at the front end.

The thrust ball race at the front end of the crankshaft is situated directly behind the reduction gear pinion, and is held in position in the two halves of the crankchamber housing, the thrust race being located by a double flanged ring, and also

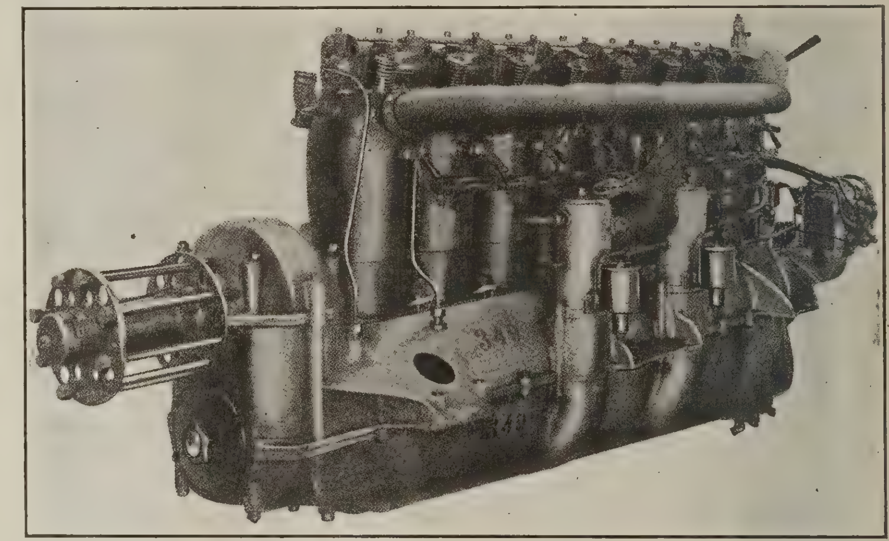
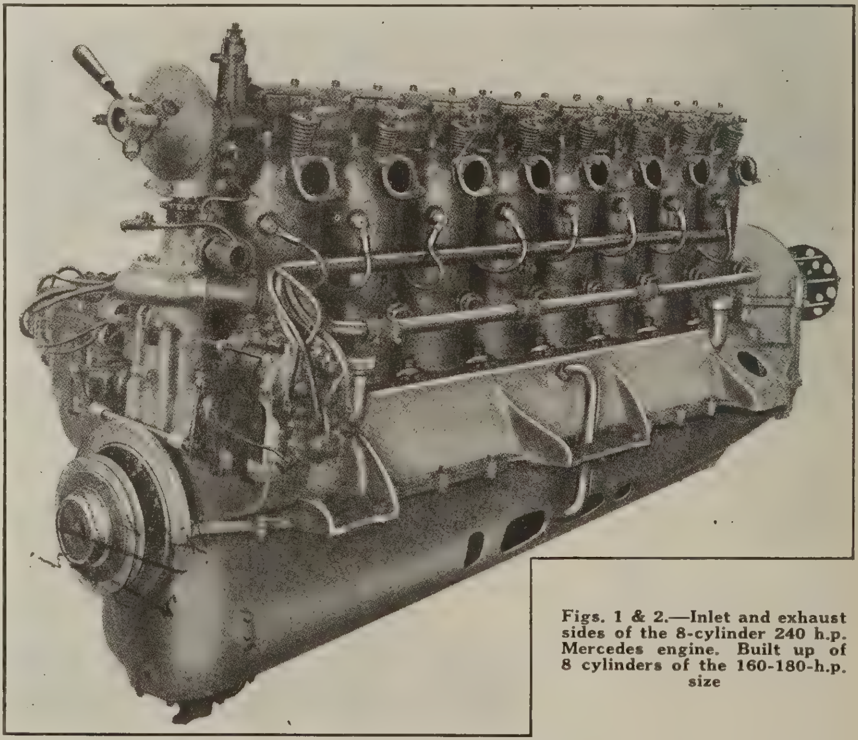
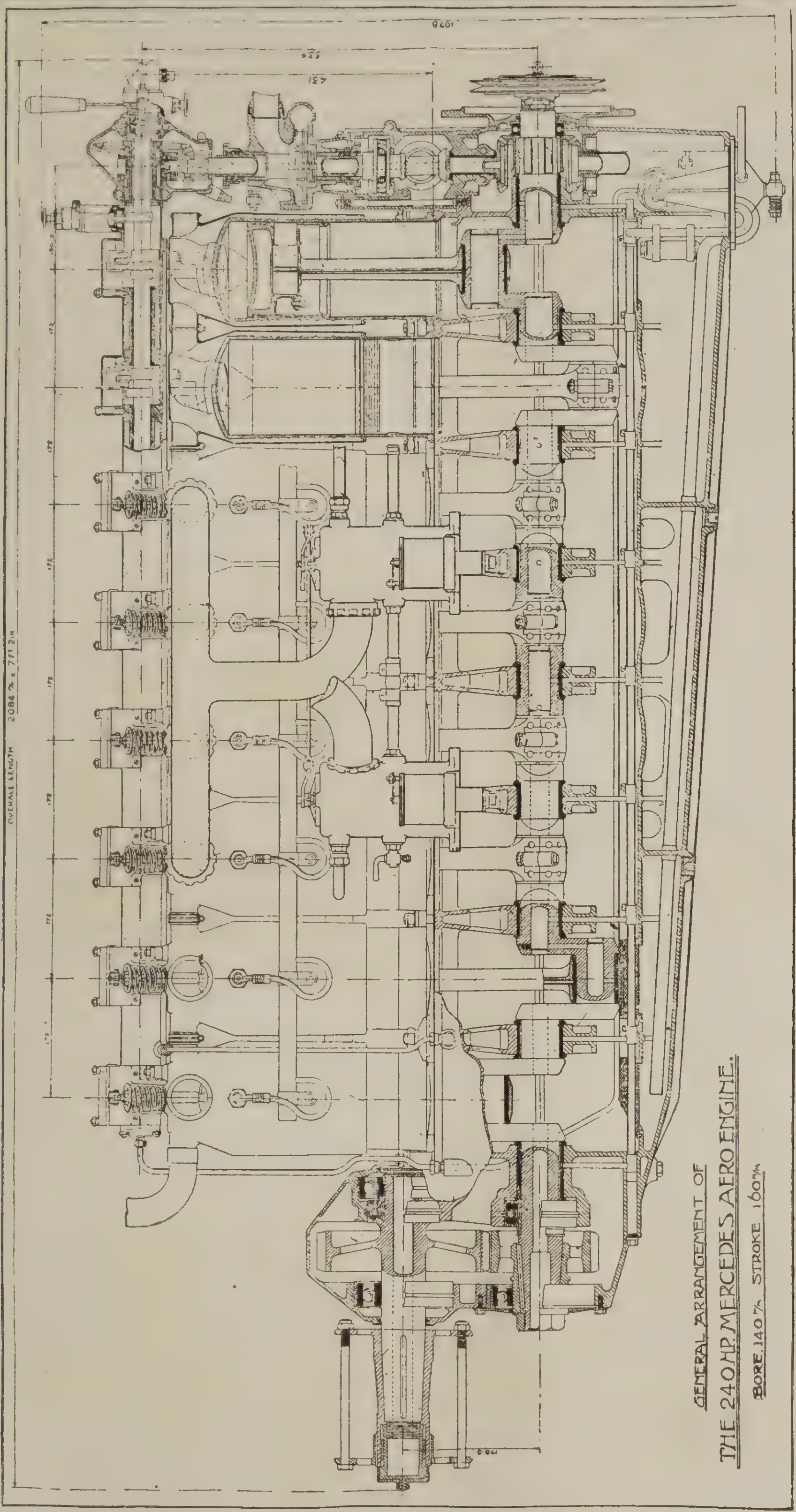


Figure 1



Figs. 1 & 2.—Inlet and exhaust sides of the 8-cylinder 240 h.p. Mercedes engine. Built up of 8 cylinders of the 160-180-h.p. size


GENERAL ARRANGEMENT OF
THE 240 HP. MERCEDES AERO ENGINE.
BORE 140% STROKE 160%
OVERALL LENGTH 2084% = 7 FT 2 IN

by a split bush and gunmetal collar on the crankshaft.

Full details of the crankshaft design are given in Fig. 8.

Reduction Gear

In view of the fact that this engine is apparently the first attempt to introduce an indirect airscrew drive on any enemy aero engine in service, the construction of the reduction gear, as fitted to the 8-cylinder Mercedes engine is of considerable interest. The general lay-out is shown in Fig. 3, and most of the details of construction in Fig. 9.

The smaller, or driving, pinion of the reduction gear is keyed to the tapered extension of the crankshaft, the key being fitted parallel to the taper on the crankshaft. The driving gear is held in position on the shaft by a large locking nut, fixed by a grub screw.

As already stated, the front end of the driving pinion is supported on a large ball race, 148 mm. dia., carried on an extension of the boss in front of the pinion.

The larger, or driven, pinion is integral with the airscrew shaft, and is machined from a solid forging, the gear wheel having holes drilled through the dished webs of the wheel to save weight. The number of teeth on the driving pinion is 26, and on driven pinion 40, giving a speed ratio of 1.54:1. The diameter of the crankshaft pinion is 168 mm., and that of the airscrew shaft pinion is 250 mm.

The airscrew shaft is mounted on two large ball bearings, and is provided with a thrust ball-race, which is located by a double flanged ring, registering with a groove cut in the bearing housing. The diameter of the front ball-bearing of the propeller shaft is 136 mm., and of the rear ball-race 128 mm.

The airscrew hub is mounted on the tapered extension of the airscrew shaft extension, and is secured as shown by a key and also by the usual Mercedes airscrew hub locking nut, which carries a flanged locking plate on a stud in front of the nut. This flanged plate, or cup, is provided with notches, cut on the inside of the flange, registering with the flats of the hub locking nut, and also with the serrations cut on the outer surface of the airscrew hub, onto which the front flange of the hub fits.

A conical metal cap was fitted front of the airscrew hub.

(To be continued)

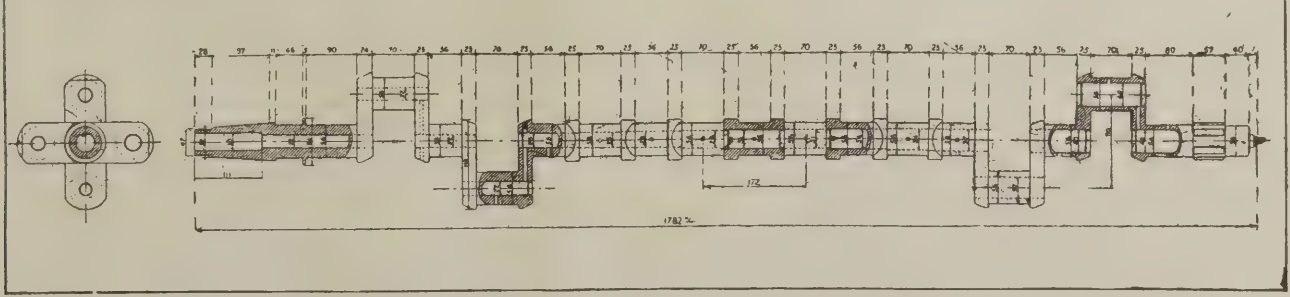


Figure 8

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

US
AERIAL MAIL

AERIAL MAIL PILOTS

- Max Miller
- Maurice A. Newton
- Robert Shank
- Ed. V. Gardner
- V. P. Hollingshead
- E. Leroy Langley

Aerial Mail Aerodromes:
College Park, Md.
Belmont Park, L. I., N. Y.
Bustleton, Penn.

AERIAL MAIL MECHANICS

- Henry Wacker
- E. N. Angle
- A. F. Cryder
- Ed. C. Roll
- Wm. C. Read
- W. O. Beatty
- Chas. King
- A. C. Danielle

Aerial Mail Service Flying Operations and Equipment Are Fully Under Post Office Control

The War Department authorizes publication of the following correspondence:

August 19, 1918.

Hon. Newton D. Baker,
Secretary of War.

My Dear Mr. Secretary: It is with pleasure that I have to advise you of the completion of the transfer of the equipment and the flying operations of the aerial mail service from the War Department to the Post Office Department on August 12. Permit me to thank you for the valuable and whole-hearted co-operation that I have received from the War Department in the inauguration and the operation of the aerial mail service. I desire to express my appreciation of the assistance received from Maj. Gen. W. L. Kenly, Col. Henry H. Arnold, Col. C. G. Edgar, Col. E. A. Deeds, Maj. William J. Fitzmaurice, Maj. Reuben H. Fleet, Capt. C. A. Willoughby, and Lieut. George J. Kinberg, of the Air Section, under whose jurisdiction and personal attention the flying operations of the aerial mail service came.

Commends Army Officers

Especially do I want to commend the six Army officers who operated the aeroplanes daily between Washington and New York with courage and conscientious regard for duty, and respectfully ask that this testimonial of their service be made a part of their military record.

Lieut. J. C. Edgerton made 52 trips on the mail route with but a single forced landing, due to an accident to a magneto in his plane. His total flying time was 106 hours and 36 minutes, and his total mileage was 7,155 miles.

Lieut. E. W. Killgore made 39 trips on the mail route, with five forced landings; 85 hours and 50 minutes total flying time with a total mileage of 5,670 miles.

Lieut. Walter Miller made 48 trips on the mail route, with four forced landings; 60 hours and 50 minutes total flying time, with a total mileage of 4,975 miles.

Lieut. Stephen Bonsal made 38 trips on the mail route, with four forced landings; 74 hours and 33 minutes total flying time, with a total mileage of 4,975 miles.

Lieut. T. H. Webb made 41 trips on the mail route, with but one forced landing; 44 hours and 49 minutes total flying time, with a total mileage of 3,680 miles.

Lieut. H. P. Culver made 36 trips on the mail route, with but one forced landing; 47 hours and 52 minutes total flying time, with a total mileage of 3,045 miles.

I think it is a high tribute to the Army's training planes and their engines, as well as to the mechanical maintenance department, that out of 270 flights conducted by the Air Section in carrying the United States mail, covering a grand total of 421½ hours of flying, there were recorded but 16 forced landings.

From May 15 to August 12, the period during which the flying operations were conducted by the military authorities, a total of 20¼ tons of letter mail was dispatched between New York and Washington, at a saving of time of from two to two and one-half hours daily.

Sincerely, yours,

A. S. Burleson,
Postmaster General.

Secretary Baker's Reply

August 19, 1918.

My Dear Mr. Postmaster General: I have received your letter of August 19, notifying me of the completion of the transfer of the equipment and the flying operations of the aerial mail service from the War Department to the Post Office Department, and citing the names of those members of the military establishment whose assistance in the creation of this service has been especially noteworthy. It will give me great pleasure to place your commendation upon the military record of the officers whom you name.

In the meantime, permit me to express my high satisfaction that the War Department has been able to co-operate with the Post Office Department so effectively, and to bring this pioneer service so successfully into actual operation.

Cordially, yours,

Newton D. Baker,
Secretary of War.

Hon. A. S. Burleson,
Postmaster General.

Spain to America By Air Is Project in Madrid

MADRID—Captain Herrera, chief of the Spanish military air forces, has had a number of interviews with King Alfonso on the subject of an aerial postal and passenger service between Spain and the United States. The scheme also has been discussed at Cabinet meetings and it is said that a leading shipping company is willing to finance it.

The plan, it is understood, is to manufacture large airships capable of carrying forty passengers besides the mails. The rate charged for a passenger, if the scheme is carried out, will be $400, and letters will be charged for at the rate of $1 per hundred grams weight (about three ounces and a half). It is estimated the journey would take two and a half days.

Major Rhinehardt, Lieutenant-Colonel

Major C. K. Rhinehardt, in command of the "flying circus" at the Mineola aviation grounds, was notified on August 24th that he had been promoted to the rank of lieutenant-colonel. Major Rhinehart is now in charge of the squadron which is making a cross-country flight. The official notice of his promotion was telegraphed to him in St. Louis.

Physicians as Flyers

Dallas, Tex.—Aug. 22.—Aeroplanes equipped with medicinal aids and manned by a skilled pilot with a physician in the observer's seat are making good at the flying field here. They are kept ready during all hours of flying practice to enable medical help to reach fallen aviators.

Aircraft Chiefs Return from Inspection

Washington, D. C., Aug. 23.—Major General William L. Kenly, Director of the Division of Military Aeronautics, and John D. Ryan, Director of the Bureau of Aircraft Production, returned from the Pacific Coast, where they made an inspection of all flying and balloon fields and visited the spruce and fir country of the Northwest. They were very enthusiastic over the progress being made at the flying fields.

AEROPLANE ROUTES TO CROSS COUNTRY

Chain of Landing Places Will Be Established by War Department

WASHINGTON—Well defined air routes, with a chain of landing fields, are to be established across the continent, according to an announcement made by the War Department. Much of this work has in fact already been done.

The well-marked safe landings will supply to the pilots shelter and limited machine shop facilities, maps, charts and barometer and thermometer ratings. Most of the landings to-day are on military fields, but local boards of trade, chambers of commerce and business men's associations in rival cities and towns have begun to compete for the location of sites.

Reports to the Division of Military Aeronautics from field officers indicate that this movement, like the good roads movement, is steadily gaining momentum, and it is predicted before another year the aviator with an ordinary modern plane will be able to make a transcontinental flight without difficulty.

The Division of Military Aeronautics has determined to concentrate the ground school training in four universities—Princeton, the University of Illinois, the University of California and the University of Texas. The schools at Cornell, Ohio State University and the Massachusetts Institute of Technology have given excellent service, but their facilities are needed for other war training.

This cutting down in the number of ground schools does not mean any curtailment of the training programme, as the four schools selected were greatly enlarged some time ago and will be able, it is explained, to take care of all needs.

Aircraft Testimony Being Made Public

Simultaneously with the publication of the report of the Senatorial sub-committee, there is being made public the testimony of Secretary of War Baker, General Kenly, Director of Military Aeronautics, and other prominent Government officials. Lack of space prevents the publication of these testimonies.

36 Aero Squadrons to Train at Mineola

WASHINGTON—Thirty-six aero squadrons, or a training brigade of three wings, will be organized at Hazelhurst Field, Mineola, it was announced by the War Department. Of the forty squadrons recently authorized, therefore, Mineola draws 90 per cent. The remaining four squadrons will be organized at Houston, Tex.

According to the plans of the War Department, the squadrons will be quartered in groups of four or nine outlying fields.

They are to serve under field conditions simulating as nearly as practicable the conditions behind the lines in France. They will train as organizations, and it is hoped to furnish them completely with personnel and equipment so that when they have finished their training in the brigade very little additional training will be required before they take their places on the front. This will also enable them to be sent to France in complete squadrons instead of detachments as heretofore.

The first of the outlying fields on Long Island which will be used for the new enlarged training operations will be Brindley Field at Commack, Lufbery Field at Wantagh, Mitchel Field at Mineola and Henry J. Damm Field near Babylon.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1. Report to places mentioned in order named for temporary duty.

Note 2. Report to Balloon Detachment, Fort Munroe, Va.

Note 3. Report to Standard Aircraft Corporation, Elizabeth, N. J. Wire DAP.

Note 4. Report to Army Balloon School, Arcadia, Cal.

Note 5. Report to Capt. G. L. Norris, Pittsburgh, Pa.

Note 6. Report to Madison Barracks, Sacketts Harbor, N. Y.

Note 7. Report to Dayton, Ohio. Wire DAP.

Note 8. Report to Lieut. H. F. Littlejohn, 480 Lexington Ave., New York City.

Note 9. Report to Aviation Gen. Supply Depot, Philadelphia, Pa.

Note 10. Report to Aviation repair depot, Speedway, Ind.

Note 11. Report to District Approvals Office, Pittsburgh, Pa. Wire DAP.

Note 12. Report to Little Rock, Ark. Wire DMA.

Note 13. Report to Aviation General Supply Depot, Middletown, Pa.

Note 14. Report to Major E. S. Moore, Buffalo, N. Y.

Note 15. Report to Ford Motor Car Co., Detroit, Mich.

Special Orders No. 178-183, Inclusive

A

Alcock, Warren Joseph	SLA; CGC
Akert, Edward Ruben	SLA; CGC
Amsden, Sherman Culver	SLA; CFT
Anderson, Edward Martin	SLA; GLC
Ainslie, Walter Melvin	SLA; RSD
Allen, James E.	FRF
Ashcraft, Edward R.	FRF
Agee, William T.	FRF
Adams, William A., Jr.	FRF
Allridge, Russell E.	RWT
Annan, Duncan C.	EOT
Anthony, Charles Augustus	SLA; RWT
Adams, Frank David	SLA; RSD
Aubert, Willie Alfred	SLA; RWT
Ailsworth, Richard E.	TFT
Athey, Clifford Dowling	SMM
Anderson, Anthony A.	WFO
Adams, David P.	FRF
Ackley, Samuel F.	FLA
Armstrong, Russell B.	FRF

B

Bremer, Carl Arthur	SLA; RSD
Browne, Lucien Webster	SLA; TFT
Becker, Albert F.	FRF
Byrns, Benjamin M.	FRF
Bryan, Edward D.	FRF
Buntin, Robert R.	FRF
Boyd, Linn	FRF
Burdick, Harold B.	FRF
Brock, William A.	FRF
Bailey, Travis	SLA; KST
Bedell, James Ware, Jr.	SLA; GLC
Bolser, Clark M.	RWT
Bolsinger, Ray Clifford	SLA; RSD
Brown, Harry G.	FRF
Bottom, Raymond B.	FRF
Boudinot, Frank J., Jr.	SLA; CGC
Beeson, William Branch	SLA; GLC
Baldwin, Charles Booth	SLA; SBI
Brown, George Reed	SLA; CFT
Benson, Hardy Moulton	SLA; CFT
Benedict, Maurice Tenny	SLA; CFT
Berry, Gilbert LeRoy	SLA; CGC
Briley, Carl Peter	SLA; CGC
Berry, Carl Davis	SLA; FOB
Barker, Rolan Sawyer	SLA; EOT
Blume, Albert Regis	SLA; DAP
Bacon, Christian O.	PFO
Blotter, Richard G.	FRF
Bennett, Robert Kenneth	LDT
Breese, Winfield S.	FRF
Boonstra, Henry G.	FRF
Beil, Richard Maybeck	FRF
Brutus, Lee Newton	SLA; LDT
Backus, Charles F., Jr.	WFO
Bakala, Chester C.	WFO
Bazley, Halsey R.	WFO
Bassett, Lowell W.	WFO
Beau, Lucas V., Jr.	WFO
Blewett, Gideon A.	WFO
Bond, Wilmer K.	WFO
Bryant, Dan J.	WFO
Boes, Walter P.	WFO
Brown, Wallace A.	WFO
Boez, Raphael, Jr.	EOT
Braun, Arnold W.	EOT
Buckmaster, Samuel A.	EOT
Brady, Frank Lloyd	SLA; KST
Buchanan, Wallace Earl	SLA; TFT
Berkowitz, Ben	WFO
Bennett, Fred C.	WFO
Billman, Elliott	FRF; WFO
Beutell, Russell Lee	SMM
Beil, Richard M.	PWM
Broyles, Ralph E.	PWM
Baker, Lee A.	WFO
Barrett, Arthur E.	WFO

Bible, Dana X	FRF; WFO
Bunn, James H	WFO
Banchor, Gordon H	FRF
Brown, Birch L	FRF
Booth, William H., Jr	TFT
Bone, Norfleet G	FRF
Blausfuss, William B	SLA; EOT
Balsley, Horace C	DMA
Bynum, Willis M	TMA
Batchelder, Chester Bernard	SLA; GLC
Bennett, Robert K	TFT
Brownstein, Maxwell	SLA; SBI
Blake, John R	EOT
Bush, Lyle K	FRF
Busk, Stephen Lionel	SLA; RSD
Bubb, Harry A	CPA
Brown, Harry George	SLA; LDT
Bickford, George Floyd	SLA; WFO
Beswick, John Sharra	SLA; LDT; FRF
Broman, Victor	FRF
Bailey, Augustus Oswald	SLA; RWT
Bauers, Frank W	SLA; VBW
Brown, Joseph	SLA; VBW
Benedict, Paul Marcus	MJA; DAP
Bonzein, Edward Barton	SLA; GLC
Brokaw, Harry Worthington	SLA; GLC
Bourman, Charles Alexander	SLA; MAC
Baker, Joseph B	WFO
Beehler, Charles H	WFO
Bent, Samuel Shaw	SLA; EOT
Boykin, Lynch D	FRF
Brown, Raymond Fassett	SLA; PMT
Brandt, Raymond Joseph	SLA; Note 10
Brown, Howard Adams	SLA; Note 5
Bullock, Edward L	Note 12

C

Carlin, Frank	FRF
Cook, Dean Charles	SLA; RSD
Cope, Robert William	SLA; EOT
Carmichael, Norvel Oscar	SLA; KST
Clarke, William B	FRF
Cook, Frank F	FRF
Connell, J. Weed	SLA; DAF
Cunningham, Wililam B	FRF
Clark, Howard E	FRF
Cowan, Robert S	DIK
Carruthers, William R	RWT
Church, Ross Emery	SLA; CGC
Cowe, Ellis A	RWT
Cunningham, George A	LHV
Carrico, Isaac B	DAF
Circle, Ralph Edwin	SLA; KST
Clawson, Harry Orville	SLA; CFT
Crandall, Gavin Devere	SLA; LDT
Cunningham, Alexander Hill	SLA; CGC
Crutcher, Merlin F	DAF
Crehore, John D	FRF
Clarke, Edmund Milton	SLA; SBI
Clarke, Frederic L	FRF
Christie, George Robert	SLA; ELA
Carlson, Arthur C	WFO
Clawson, Henry O	WFO
Chapman, Allen	EOT
Campbell, Robert L	FLA
Crandall, Norris I	WFO
Costar, Lloyd	TFT
Cooksey, David Jay	SLA; GLC
Clarke, Howard Pickford	SLA; EOT
Crowl, Leon Wesley	SLA; SBI
Clark, John E	WFO
Clark, Gorden W	WFO
Coleman, Robert H	WFO
Compton, Earl V	WFO
Compton, Howard	WFO
Currie, Kent D	WFO
Copley, Dewitt H	WFO
Curry, Ezra Benham	SLA; HHN
Chambers, Roger James	SLA; GLC
Cruickshank, Bruce D	FRF
Cain, Hubert O	TFT
Chetlain, Frederick Hamilton	SLA; CRI
Carlson, Hjalmar F	SLA; SMM
Card, Thomas Buell	SLA; ELA
Coffee, John Alfred	SLA; WFO
Carberry, Joseph E	EOT; WDM; NOTE 1
Curtis, Erland Lofton	SLA; RSD
Christy, Wynn O	TFT
Cotton, John B	TFT
Carter, Warren Rice	SLA; KST
Christopherson, Fred Carl	SLA; RSD
Cleveland, Lyman W., Jr	TFT
Cole Raymond T	FRF
Creighton, William J	WFO
Chase, Samuel W	WFO
Cotton, John B	TFT
Cochrane, Robert Malcolm	SLA; RSD
Circle, Ralph E	PWM
Conaty, Walter Joseph	FLA; Note 3

D

Dickinson, Clarende Roy	SLA; GLC
Dilworth, Dewees W	HHN
Duryea, Harold A	SLA; CGC
Dudley, William Allen	SLA; GLC
Davis, Nathaniel Penistone	SLA; GLC
Davenport, William H	DAP
Davis, George Edward	SLA; GLC
Dhein, Irwin Orion	FRF
DeShazo, Peter H	FRF
Dobson, Matt H., Jr	FRF
Disher, Harry P	CRI
Dana, Deane	FRF
DeViney, Albert Faris	SLA; EOT
De Vore, Ralph Roland	SLA; DAF
Duggan, James Reynolds	SLA; KST; FRF
Dolan, Clare Charles	SLA; ADT
Dorger, Clarence Alphonse	SLA; SBI
Demarest, Stirling James	SLA; DAF
Dooley, Payton Y	FRF
Dougherty, William A	BST
Day, Robert G	WFO
DeCamp, Merritt J	WFO
Decker, Kenneth N	WFO
Drake, Chester M	WFO
Duncan, John C	WFO
Dwyer, Martin J	WFO
Dawson, Thomas E	GLC
Davis, William R., Jr	FRF
Dresher, Stanley Oscar	SMM
Dougherty, William A	FRF
Dougherty, Gordon William	SLA; SBI
Dickenson, Robert W	FRF
Dally, Joseph Warren B	SLA; EOT
Davis, Eugene T	FLA
Dawson, Charles B	DMA
Davidson, Robert M	FRF
Devries, Joseph R	EOT
DeWald, William N	WFO
Durfree, Charles P	BST
Donnelly, James J., Jr	FRF
Dickason, James Frank	EOT
DesChamps, James W	WFO

E

Evans, Charles J	SLA; CAF
Emert, Joseph Rollo	SLA; CGC
Evans, William Kendall	DAP
Earley, George Emerson	SLA; CWT
Essig, Fred N., Jr	SLA; RSD
Ewan, Charles V	FRF
Elliott, Milton	FRF
Eastman, Andrew J	PFO
Ehrenberg, Conrad E	PFO
Eastman, Andrew J	FRF
Eilenberger, John T	KST
Evan, Lawton Bryan	SLA; PMT
Edwards, George H., Jr	SLA; CRI
Eaton, Charles Francis	SLA; SBI
Ely, Carl Brandes	MJA; DAP
Evans, Evan Cyefeliog, Jr	SLA; RSD
Early, Lawrence	WFO
Egbert, Perry T	WFO
Elkema, Emil C	WFO
Erickson, Harold	WFO
Erickson, Robert	WFO
Evans, Christopher J., Jr	FRF
Ellis, Oliver Everett	SLA; CRI
Eskind, Earnest	FLA
Edwards, Alton Wood	SMM
Edmondson, Walter O	FLA
Ehrlichman, Rodolph E	WFO
Ewing, Oscar R	CPA

F

Ferry, Joseph Rutherford	SLA; PMT
Fletcher, Wallace Robinson	SLA; RSD
Frew, Ralph C	FRF
Frazer, Allen Fulton, Jr	SLA; LHV
Fieweger, Thomas E	FRF
Fiester, Ritner I	FRF
Fancher, Willard L	SBI
Frank, Graham M	CAF
Foss, Alden Simonds	SLA; HHN
Ford, Edgar Kay	SLA; PMT
Fagan, Paul I	DMA
Fowler, Thomas	FLR
Fritshie, Arno R. G	SLA; VBW
Foster, Benjamin Randall, Jr	SLA; MAC
Fall, Harold A	WFO
Fischer, Karl W	WFO
Ford, Lewis E	WFO
Fraser, Walter	WFO
Freeman, Orville Burch	SLA; MAC
Fisher, Ewing Benedict	SLA; LDT
Fluer, Peter Earl	SLA; RSD
Flowers, John M	FRF
Fehlman, Leo G	WFO
Fox, Buell Kirk	SMM
Freeman, Orville B	WFO
Fuller, Robert N	TFT
Fisher, Floyd Clayton	SLA; TFT
Ford, Eugene Edward	SLA; Note 7

G

Grady, Anthony James	SLA; KST
Gregory, Omar B	FRF
Glezen, John C	SRC
Gore, William M	WFO
Graham, Charles F	WFO
Gabriel, William C	FRF
Greer, Everett M	FRF
Guppy, George	CAF
Guidera, Albert M	FRF
Garwood, Sterling M	FRF
Gilchrist, Hugh R	FRF
Goodwin, Grover	FRF
Goetjen, Floyd L	WFO
Grantham, Harry N	WFO
Graven, Carl M	WFO
Grimes, Carl A	WFO
Groah, Gordon L	WFO
Gross, Edward H	WFO
Garrison, William H	DMA
Geiger, William D	CAF
Grady, Anthony J	WFO
Gabriel, William Carl	SLA; CRI
Goddard, Glenn	SLA; LDT
Gardner, Roy B	FRF
Gard, Charles C	FRF
Gilfillam, William E	WFO
Goddard, Fred C	FRF
Garnier, Edward W	KST
Griffis, Claude F	SLA; Note 8
Gabrielson, Guy George	SLA; Note 15

H

Horn, Charles Adam	SLA; CGC
Hickman, Cecil Rogers	SLA; CAF
Herrink, Louis S	FRF
Hosack, Carl I	FRF
Hill, James Aquilla, Jr	SLA; TFT
Haserot, John Hawley	SLA; CGC
Horton, Russell Brewster	SLA; PMT
Hiatt, John B	PFO
Hogan, W. Clifton	HHN
Hardy, Arthur A	FRF
Hadeen, Edward A	ASM
Henderson, Hugh M	FRF
Hanchett, Frederick W	FRF
Harris, Joseph Pratt	SLA; RSD
Harding, William Kelly	SLA; RSD
Hogan, William N	FRF
Heffley, Armor S	PFO
Hansberger, Ernest S	PWM
Holmes, John W	FRF
Ham, David H	FRF
Howland, Dudley Sly	SLA; KST
Heartfield, Charles B	SLA; SRC
Henderson, Edmund Millard	SLA; KST
Heine, Bernhardt E	TFT
Hoyt, Howard C	TFT
Haywood, Chester B	TFT
Houston, Forest K	TFT
Henderson, Peter	RSD
Hessey, John Hamilton	SLA; CAF
Halsey, Wilmot N	WFO
Henderson, Denny E	WFO
Hook, Joseph A	WFO
Hood, Everett D	CRI
Hyde, Charles James	SLA; LDT
Hardy, Richard L	FRF
Haimes, Frank B	WFO
Hale, January R	WFO
Hall, George L	WFO
Harbage, Homer B	WFO
Hartman, Clarence A	WFO
Hayden, Max E	WFO
Healy, Michael V	WFO
Heng, Jacob A	WFO
Howard, Raymond E	WFO
Hughes, Albert E	WFO
Hunt, Ralph V	WFO
Hosier, John H	FRF
Hauck, Cornelius J	FRF
Harned, Doyce Harry	SLA; DAF
Hanna, Leonard C	FLA
Hogan, John Greeney	SLA; EOT
Hooper, Klein L	FRF
Hallberg, Lloyd C	WFO
Harris, Robert F	WFO
Hagner, John R	FRF
Hicatt, James P	FRF
Harwell, Ervin L	FRF
Haldeman, George W	FRF
Hueffner, Frederick William	SLA; CFT
Hilliard, Beverly Campbell	SLA; ADT
Hodgson, Harold C	WFO
Hayes, Charles L	FRF
Holmes, Charles Wesley	SLA; Note 11

I

Ingels, Giltner R	FRF
Ingoldsby, John LeRoy	CPA; DAP
Illges, Abraham	FRF
Ihrig, Howard K	FRF
Ives, Howard C	FRF

J

Jagger, Kenneth Reeves	SLA; CGC
Jones, Lloyd Bidwell	SLA; KST
Johnson, Walter Richard	SLA; RSD
Jones, Ralph E	PWM
Johnson, Raymond C	FRF
Jones, James D	FRF
Johnstone, Hugh R	FRF
Jones, Nathaniel R	SMM
Jenkins, James William	SLA; CWT
Johnston, Edgar Grant	SMM
Jakway, Clyde Clifton	SLA; CWT
Jesse, William R	FRF
Johnston, Douglas T	FLA
Jaccard, William N	WFO
Jones, Howard H	WFO
Jones, Ira M	WFO
Jones, Roy L	TFT
Jones, Roderick H	TFT
Jones, William F	WFO
Johnson, Donald Peter	SLA; EOT
Jensen, Karl	FRF
Juett, John C	FRF

K

Kennedy, James Henry	SLA; EOT
Kauch, Robert	KST
Keenan, Lorenzo J	KST
Kares, Edward Henry	SLA; GLC
King, Ivan R	APR
Kline, Mason Edward	SLA; GLC
Kinney, Charles L	FRF
Kile, Neil E	WFO
Kratzer, Henry A	WFO
Keyes, Nelson B	FRF
Korfhage, Harry George	SLA; GLC
Kendall, Harry A	FRF
Kesling, Ernest Erle	SLA; RSD
Knettle, Lemyrt Dix	SLA; DAF
Keally, Francis	SLA; ADT
Korman, Howard	SLA; KST
Kelso, Floyd Leaman	SLA; MAC
Kelly, Raymond James	SLA; CAF
Kelly, Andrew Park	SLA
Krum, Howard E	FRF
Kirkpatrick, Everett L	TFT
Knupp, Glenn H	MAT
Kipp, Eugene Harvey	SLA; CFT
Koch, Albert Nicholas	SLA; WFO

L

Lee, Harold James	SLA; EOT
Lancaster, Percy W	SLA; CGC
Lawrence, Herbert R	RSD
Lockhart, Frank	DIK

LaFon, Alphonse F	FRF
Littlefield, Henry M	FRF
Levy, Royal	SLR
Leonhardt, Elmer G	FRF
Locklear, Ormer L	FRF
Lister, Harold R	PFO
Leroyer, Charles P	CAF
Largey, Hugh D	FRF
Lockhorn, Clifford J	BST
Lalley, Walter Rowe	SLA; KST
Lucas, Gilbert L	TFT
Lutton, Robert D	WFO
Lyon, James L	WFO
Ludwick, Frank McConnell	SLA; LHV
Lathrop, Julian Langson	SMM
Little, Roy Armstrong	SMM
Leopold, Joseph	HHN
Larkin, George Brandreth	SLA; ADT
Leute, Garl Milne	SLA; MAC
Lenderking, Louis Theodore	SLA; KST
Littlejohn, Joe Lake	SLA; DAF
Londrigan, Joseph A	SLA; SMM
Lloyde, Robert Kellogg	SLA; CUI
Lawhon, Guy Bryan	SLA; LDT
Lincoln, William A	FRF

M

Morehead, Hobart F	LHV
Morrissey, Merle F	LHV
Martin, John H	PFO
Mensch, Sterling R	FRF; PFO
Morgan, William T	PFO
Mueller, Ralph H	PFO
Malott, Volney T	DAP
Muehlberg, Clarence E	FRF
Mowry, Jared J	WFO
Mulvihill, Bernard H	WFO
Murray, John G	WFO
Matheison, Joseph	FLA
Macaulay, Charles R	FRF
Mathews, George C	BST
Murray, John G	BST
Merrill, Basil Edmund	SLA; CGC
Miller, Stanley Christian	SLA; CGC
Morris, Edward S	FRF
Masel, Max	SLA; CGC
Mathews, George Clifford	SLA; LDT
Miner, Vern E	FRF
Massey, Raymond F	FRF
Miller, Royall M	FRF
Meredith, Martin Prentice	SLA; CGC
Morrow, Dudley A	FRF
Moore, Benjamin L	FRF
Murchie, Howard Franklin	SLA; HHN
Meyer, Frank Wellington	SLA; SBI
Myers, Joseph A	KST
Milnor, Paul C	PWM
Morfa, Raymond J	FRF
Mabry, Harry Cooper	SMM
Magill, James Wright	SMM
Morris, Charles Wilson	SMM
Murphy, Charles Cornelius	SMM
Morgan, Henry Suter	SLA; EOT
Maxwell, Warren A	GLC
Means, Leland M	GLC
Morgan, Marion H	GLC
Murphy, Gerald Joseph	SLA; SMM
Monthan, Oscar	SLA; TMA
Mahaffie, James E	WFO
Mahler, James B	WFO
Malik, Louis	WFO
Mason, Clesson E	WFO
Maxwell, Fred C	WFO
Mayo, Francis P	WFO
Mehlop, Thomas P	WFO
Merrick, Ward S	WFO
Merrill, Cylde H	WFO
Meyer, Jerome G	WFO
Miller, Wyman F	WFO
Mills, Davis W	WFO
Mitchell, William R	WFO
Moffet, Ralph C	WFO
Moreton, Amos L	WFO
Morsch, Jesse J	WFO
Morris, Thomas K	FRF
Mefford, John Archdeacon	SMM
Moore, James	SMM
Miller, Edward H	WFO
Moody, Martin Juel	SLA; SBI
Mayer, Herbert Carleton	SLA; RWT
Mast, Walker E	WFO
Miskell, James B	WFO
Massey, Ivor	WFO
Martin, Douglas E	TFT
Muirhead, Brian R	WFO
Morrissey, John F	WFO
Moynihan, Frederick Michael	SLA; WFO
Moore, Harold Edward	SLA; DAF
Malone, Austin M	KST
Martin, William T	TFT
Meyer, Edward	TFT
Maher, Michael James	SLA; EOT
Mead, Theodore S	FRF
Moffitt, Howard Francis	SLA; MAC
Murray, John Dayton	SLA; RSD
Marberry, Jason Maurice	SLA; CAF; FRF
Mucke, Henry Constant	SLA; RSD
Mayfield, Charles R	WFO
Mason, Edward John	SLA; CAF; FRF

Mc

McKinney, Oakley W	FRF
MacManus, Clare Clement	SLA; EOT
McMurray, Robert J	DMA
McDowell, Lloyd J	PFO
McClintock, Arnold R	LHV
MacDonald, Russell C	BFT
McGrath, John William	SLA; KST
McDonough, Edward F	FRF
McCunn, John Niven	SLA; CGC
McGovern, Edward T	FRF
McNeil, Guy L	PFO
MacDowell, Bruce A	FRF
McCadden, Glen J	BST
McEachin, James S	FLR
MacKenzie, Hugh F	LHV
McMillan, Neil T	LHV
McAuley, Benjamin F	BST
McCarty, Elsworth L	CUI
McAbee, Louis A	CPA
MacHarg, Malcolm	SLA; TMA
McCadden, Glen John	SLA; RSD
McVay, George E	FRF
McArthur, John K	GLC
McCormack, Earl N	GLC
McElin, Bertrand J	TFT
McCormack, Fred Bay	SLA; MAC
MacAuley, Alexander V	WFO
McNabb, Harold R	WFO
McHugo, Jack R	WFO
McKenny, Torry Thrift	SLA; SMM
McGrath, John W	TFT
McDonough, Andrew Leo	SLA; CWT
McDougal, John Byron	SMM
McGregor, Joel I	FRF
McLean, Norman Reynolds	SLA; RWT
McBride, Clarence E	FRF
McKnight, Thomas Allan	SMM
McKinney, William Henry	EOT
McSherry, Frank D	FRF
McDowell, Lloyd I	FRF

N

Nolte, Julius Mosher	CAF; FRF
Nissager, Fred E. M	EOT
NacNary, Harry Calkins	SLA; GLC
Niday, Hugh D	DAF
Norgren, Nelson Henry	SLA; MAC
Newlin, Harold Vance	SLA; KST
Nemyer, Henry Earl	SLA; CAF; FRF
Needham, Chauncey, E	WFO
Neely, John H	SMM

O

Orand, David H	WFO
Owen, James P	WFO
Oser, Chester Arthur	SLA; CGC
Oswald, Fred	FRF
Ozier, Richard P	FRF
O'Dea, Bernard Joseph	SLR
O'Connell, Robert E	FRF
O'Neil, Joseph H	FRF
O'Brien, Maurice Edward	SLA; CGC
Ort, Karl S	FRF
O'Leary, Arthur C	Note 2
Ormsbee, Harry Selfridge	SLA; TFT
Orr, Tasso V	DMA

P

Park, James W	WFO
Payne, Owen S	WFO
Payneter, Henry M., Jr	WFO
Perry, William L	WFO
Peterson, Frederick R	WFO
Pierson, Stanley H	WFO
Prosser, Stuart A	WFO
Price, Walter E	FRF
Price, Hunter J	FRF
Prentiss, Paul H	FRF
Porter, Henry W	FRF
Perry, Floyd L	FRF
Pulliam, Ellis Page	SLA; LHV
Park, Clifford George	SLA; CGC
Peters, Crawford A	FRF
Pierce, Leonard R	FRF
Pieper, Clifford Earl	SLA; EOT
Parmley, George W	FRF
Pfiel, Paul F	FRF; TFT
Phelps, Raymond W	PFO
Pirkham, Henry P	PFO
Pavey, Smith W	FRF
Plosser, Joseph B	FRF
Plantz, Edward C	FRF
Payner, Walter T	EOT
Porter, Oscar S	EOT
Parker, Charles W	FRF
Prouty, Eugene Royal	SLA; CGC
Powell, Russell E	CAF
Proctor, Harold L	RWT
Phillimore, Walter Notman	SLA; KST
Pilkington, Fred Wesley	SLA; KST
Patterson, Frederick Beck	SLA; Note 6
Puckett, Thomas Lytell	SLA; MAC
Parish, John Joshua	SLA; SMM
Pliska, Joseph S	HHN
Poindexter, Francis	SLA; WFO
Proctor, Ivan Lewis	SLA; TMA
Preble, Robert Curtis	SLA; RWT
Pfleger, Gustav	SLA; VBW
Phelps, Edward George	SLA; MAC
Parker, Troy La Salle	SMM
Preisker, William Henry	SLA; RSD
Parr, Eliza W	FRF
Pharr, Query	FRF

R

Rader, Alexander Knox	SLA; CGC
Rowe, Charles Bar	SLA; GLC
Ransom, Harold John	SLA; CGC
Reed, Walter J	FLR
Reed, Harold Varas	SLA; DAP
Rodeny, Archer Ulysses	SLR
Ragsdale, Grover C	FRF
Rundle, W. B	FRF
Reeves, Dache M	FRF
Ranney, Lynn A	FRF
Ramsay, Allan P	FRF
Redmond, Forest H	WFO
Reynolds, Arnold R	WFO
Reeve, Jay F	WFO
Reeves, Rober H., Jr	WFO
Rice, Ralph W	WFO
Ripperger, Clarence W	WFO
Ryan, John N	WFO
Reynolds, Leo F	EOT
Rossiter, Ednor M	EOT
Ross, Malcolm H	EOT
Rountree, Andrew J	FRF
Raney, John K	FRF
Ransom, Harold B	FRF
Rafferty, Reginald New	SLA; KST
Rice, George E	EST
Roberts, Fred G	FRF
Robinson, William R	CFT
Rady, William Jennings	SLA; RSD
Rogers, Walter Eugene	SLA; CGC
Raque, Carl P	FRF
Read, Elmer Morton	SLA; Note 6
Rogers, Rufus B	RSD
Rice, Edward Thomas	CPR; ALF
Radford, William Addison	SLA; DAF
Riba, Leander W	WFO
Robson, William W	WFO
Russell, Howard F	WFO
Rowlinson, Walter Shipman	SLA; TFT
Ranney, Ambrose E	FRF
Robinson, Edward A	DMA

S

Scherzer, Ralph J	EOT
Sinclair, William C	EOT
Sloan, Harry	EOT
Stalker, Willard C	EOT
Stodder, John D	EOT
Sykes, George E	BFT
Sheridan, Hiram W., Jr	FRF
Smith, Alexander D	FRF
Shormey, George H	FRF
Scoby, Hal A	PFO
Smith, Frank H	PFO
Stenhouse, Lester U	PFO
Safford, Loyal R	WFO
Savage, Joe W	WFO
Scull, Leo N	WFO
Seaver, Lloyd R	WFO
Seymour, Leland S	WFO
Shope, Leslie R	WFO
Shreve, Arthur L	WFO
Silverman, Michael M	WFO
Scto, Earle	WFO
Spangler, Earl O	WFO
Spier, James E	WFO
Steel, John A	WFO
Spelbrink, Bernard Henry	FLR
Scott, Leslie P	FLR
Shotwell, Charles S	FLA; DAP
Spitznagle, Fred August	SLA; CGC
Sipp, Edward Arden	SLA; DAP
Shewmon, Dan Dinmitt	SLA; GLC
Shamper, James Robert	SLA; CGC
Stanton, Edgar	ELA
Sites, Harold D	KST
Smith, George D	FRF
Shea, Thomas F	WFO
Snyder, James Lambdin	CPA; VBW
Stapley, Edward R	BST
Stallings, Alcy Lowell	SLA; KST
Smith, John J	FRF
Spencer, Eben S	FRF
Smith, Vincent K	FRF
Straub, Van Vanderbilt	HHN
Schell, Harold W	FRF
Stephenson, James R	WFO
Stetson, Phillip C	WFO
Slocum, Donald	FRF
Steward, Wayne D	FRF
Sanders, Thomas Jesse	SMM
Shepard, Floyd W	FRF
Sherrill, Guy P	DIK
Shilt, Noble C	FRF
Schenk, Lawrence	CAF
Strickland, Ralph M	CRI
Shippy, Leo C	BST
Snyder, Laurence N	FRF
Smith, Clarence A	FRF
Smith, Clarence	FRF
Skelly, John S	FRF
Sanders, William C	FRF
Stokes, William R	RTT
Smith, Herbert Charles	SLA; KST
Sanford, John D	BFT
Snyder, Everett Whipple	SLA; Note 6
Spencer, James Brookes	SLA; Note 14
Saunders, John Jacob, Jr	SLA; PMT
Swain, Roland H	FRF
Sigward, Sylvester Lewis	SLA; CAF; FRF
Stough, Robert Andrew	SLA; WFO
Stuller, Gilbert Fitch	SLA; FOT
Swinson, Casper D	FRF
Sargent, Bradley Eckhardt	SLA; MAC
Snedicor, Howard T	HHN
Shimmon, Joseph Malek	SLA; PMT
Smith, Harry Leonard	SLA; DAF
Sandlin, James H	WFO
Scott, Ernest D	WFO
Sessions, Henry F	WFO
Sproull, William C	WFO
Seaton, John William	SMM
Shepard, Frederick Burr	SMM
Squires, Paul Revere	SMM
Sizer, Theodore	FLA
Smith, Charles F	FLR
Smith, Herbert Hamilton	SLA; FOT
Sherer, Bud Francis	SLA; RSD
Sullivan, Mitchell Sanborn	SLA; GLC
Shafer, Wayne	SLA; DAF
Speck, Frank C., Jr	SLA; FRF
Smith, Alexander Palmer	SLA; CAF
Schumacher, Herman Oscar	SLA; CAF
Soule, Arthur L	FRF
Snow, William J	FRF

(Continued on page 1241)

ITALIAN WAR AVIATION

By CAPTAIN GIUSEPPE BEVIONE

Chief of Italian Military Mission for Aeronautics

EVERYBODY knows that the war industries of all the Allied nations, and particularly the industries of aviation, draw from America the essential part of the raw materials they use.

The magnificent victories of the Allied armies during these last days, which have added so much glory to the American name make us wonder at the splendid results that might be obtained, were we able to realize that which we most need now —a supremacy of the air, so as to pursue the retreating foe with our squadrons of aeroplanes, spreading terror and disorder among its lines and destroying and closing railway junctions, roads, bridges and trestles.

As far as raw materials, industrial organization and man power are concerned, the Allies can produce and equip an aerial fleet at least ten times larger than that of the Central Powers. If this result can be attained in 1919, if within eight months the Allies together with this country, can count upon having in Europe ten thousand aeroplanes more than the enemy and will make them serve their purpose skillfully and inexorably, the war will be won. The foe's power of resistance would be struck at its very vital source, at its center of supplies, at the great factories of arms and ammunition, and bridges, railways and roads through which the armies at the front are kept in fighting trim. But in order to carry out in its entirety this simple plan (as nothing decisive could be attained unless it were fully developed) all of us, governments and peoples, must be aware of the absolute and obvious fact, that the aerial army is of the greatest import, and that aviation can give us a formidable contribution towards the refusal of any dastard peace compromise that Germany and Austria may try to impose upon us. Aviation is a sure means of victory, and to it we must devote without hesitation and without reserve all of our efforts and best resources.

I am betraying no secret in assuming that the closest agreement has been reached on this fundamental point between the American authorities in charge of the industrial and technical development of aviation and the Italian Commissioner for Aeronautics, the Honorable Chiesa; he has been such a vigorous incentive to our aviation industry that he has brought it within a few months to its magnificent development, well deserving of far reaching results. But in order to have an unlimited output of its powers and production, Italy is obliged to seek from this country an adequate and continually increasing quantity of raw materials, metals, wood, dopes and textile matter. It is an absolute necessity that we obtain such assistance from the American Government, of course, in perfect harmony with the needs of our Allies, and for this purpose I was sent to Washington and appointed Chief of the Italian Military Mission for Aeronautics.

I will endeavor to develop my program in the most logical and persuasive manner, proving to the Federal authorities that Italian aviation is well worthy of the assistance it is demanding of the generous and powerful American nation.

I will show you how efficiently raw materials that have been provided us are being utilized, and I shall keep the men in charge of the United States Aviation Board in close contact with every progress and acquainted with the great expectations that are in store for our Italian aircraft production.

This progress is indeed remarkable, and every Italian can justly be proud of it. Italy has today passed the critical period of experimental research and of uncertainties, always to be overcome at the beginning of new enterprises.

Today Italy is supplying its own needs in motors and planes entirely, besides using its own original types of machines; and within a few months all the machines flying at the Italian front will be of Italian manufacture and design, and equipped with Italian motors.

It is generally known that military aviation needs four types of machines: fighting, scouting, day bombing and night bombing machines. As to fighting aeroplanes, we now turn out two splendid types, the A-1 (so-called "Balilla") a machine developed from the S. V. A. of the Ensaldo factory; and the "Pe-Gamma" from the original plans of the Pomilio Works (recently taken over by the Ansaldo factory).

As to the other types of flying machines for warfare, Italy is well provided with models of her own, which are produced in large series. We have, in fact, two types of scouting machines of high value; the Sia 8-B (developed from the former 7-B type) made by the SIA factory, which is a branch of the FIAT, and the P.F. of the Pomilio factory, which, as previously stated, has been incorporated into the Ansaldo Works.

Two important raids were performed last year by the SIA 7-B aeroplane; that is, the flight Turin-Naples and return (1,004 miles) without landing, and Turin-London (700 miles) with the crossing of the Alps.

For day bombing, where speed and great power are essential, two Italian machines are ready today, which have already undergone the most severe tests. One is the SVA, built by the Ansaldo Factory, which can also be used for fighting and scouting, and has already accomplished the bombing of Inasbruck, besides performing the raid on Friedriechshafen. The second machine is the SIA 9-B, equipped with a FIAT engine of 799 h.p., which, owing to its speed and great power, can be flown over long distances and be used in broad daylight bombing.

For night bombing there are the biplane and triplane Caproni, now of international fame. The larger model of Caproni biplane (CA-5) equipped in Italy with three FIAT motors of 300 h.p. each, is without doubt superior to all similar types in existence, so much so that our Allies, American, British and French, have largely adopted it; and at the French front several Italian squadrons of Caproni are in active service, adding new records to their well-established reputation. It is also known today that at Mineola, L. I., the first Caproni built in the United States and equipped with American Liberty Motors has gone through its tests with the greatest success, and that the Federal authorities have since placed with American firms large orders of Caproni-Liberty aeroplanes.

I firmly believe that Italy can be proud of its aviation achievements and victories; as on the 15th of last June, the first day of the ill-fated Austrian drive on the Piave, 34 Austrian aeroplanes were downed, and only two of our machines were reported missing.

But no aeroplane, as perfect as may be its design and construction, could be of any service if not equipped with the best and most reliable motor, and if the capacity for production or the factories connected with the manufacture of aircraft were not equal to cope with the demands for the keeping up of the

A squadron of S. V. A. Italian scouts equipped with Spa motors, ready for flight. On August 10th word was received here that
approximating 875 miles. While over Vienna the squadron

The propeller department of the Italian Pomilio factory which has now been taken over by the Ansaldo concern. Official photo

full efficiency of the aerial force. And here again have Italy's efforts been met with success.

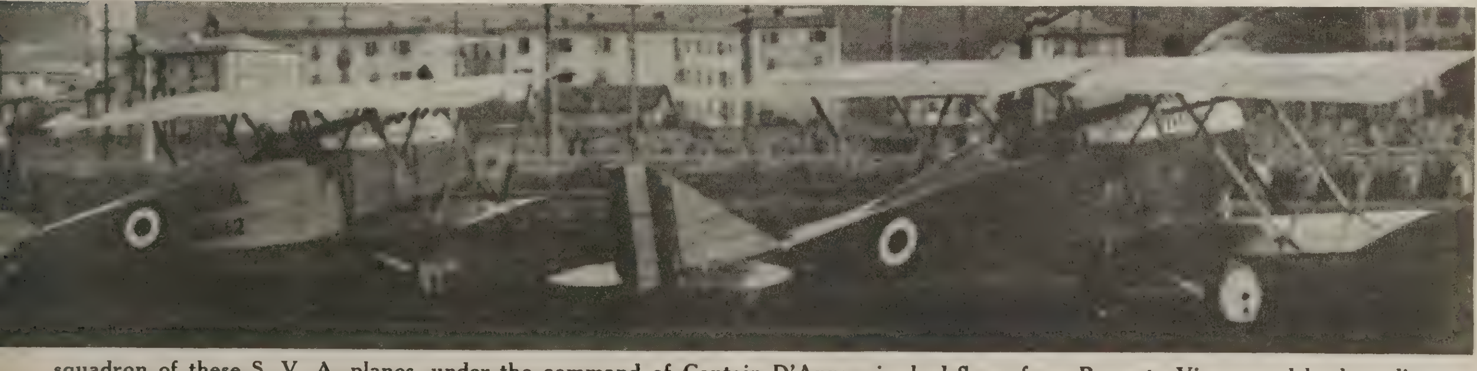
The FIAT factory stands first as one of our largest manufacturers of aviation motors, with her two well-known engines, the A-12 and the A-14. The A-12 develops 300 h.p., and the A-14, 700 h.p., this being the most powerful motor used at the front for aviation by any of the Allies. The FIAT has a remarkably large output of these engines, and I regret that for obvious reasons I cannot give the exact figures concerning it. But I can say that our Aeronautical Department, which buys all this production, after having met with all of our own requirements, can afford to supply the Allies with an important number of these motors daily, in compliance with their urgent demands. Besides this, the FIAT has now ready a new model which will soon be produced in large series: the A-15 of 450 h.p., greatly reduced in size from previous models, light, accessible, and possessing new and important characteristics which will undoubtedly cause a further and greater development of our military aviation.

In addition to the FIAT, we have the SPA of the well known automobile factory by that name, which with some important changes and only a light increase in weight, has been able to develop her old 220 h.p., motor into a new 300 h.p. motor, without being obliged to change her former equipment and machinery—thus mastering a great technical and industrial success, and producing a new engine of slight specific weight and great power. These motors are already being turned out in large series, and will be of the greatest value to aviation, especially fitted to fighting aeroplanes.

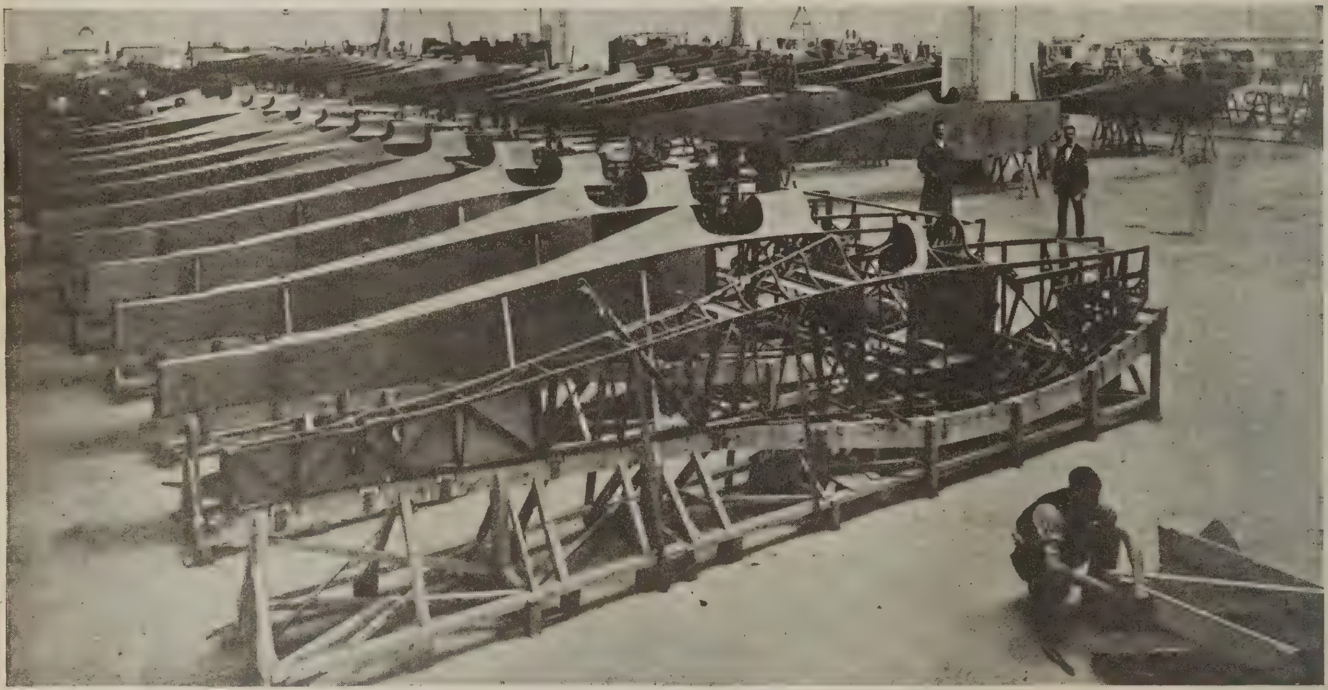
Another important factory, the Isotta-Fraschini, produces high-grade machines, which have won reputation for their reliability and perfect workmanship; here again a new motor is ready, the I.F.V.-6, developing 300 h.p., greatly appreciated both by aeroplane manufacturers and pilots.

I shall not mention minor though excellent factories, among which excel with many others the Nagliati, the Colombo, etc.; nor the greater works which have taken up the manufacture of some of the motors described above, such as Bianchi, Tosi, Breda, etc.

The following figures may give a more correct idea of Italy's effort in the production of aviation motors: 1,500 motors a month being the present output, before the end of the year we shall certainly produce over 2,000 motors monthly, which means the astonishing figure of 24,000 aviation engines per year; and all of them of Italian design, of Italian construction, all of high repute, established after the severest tests. And



squadron of these S. V. A. planes, under the command of Captain D'Annunzio, had flown from Rome to Vienna and back, a distance dropped over one million manifestoes.—Official photograph.



Official photograph.

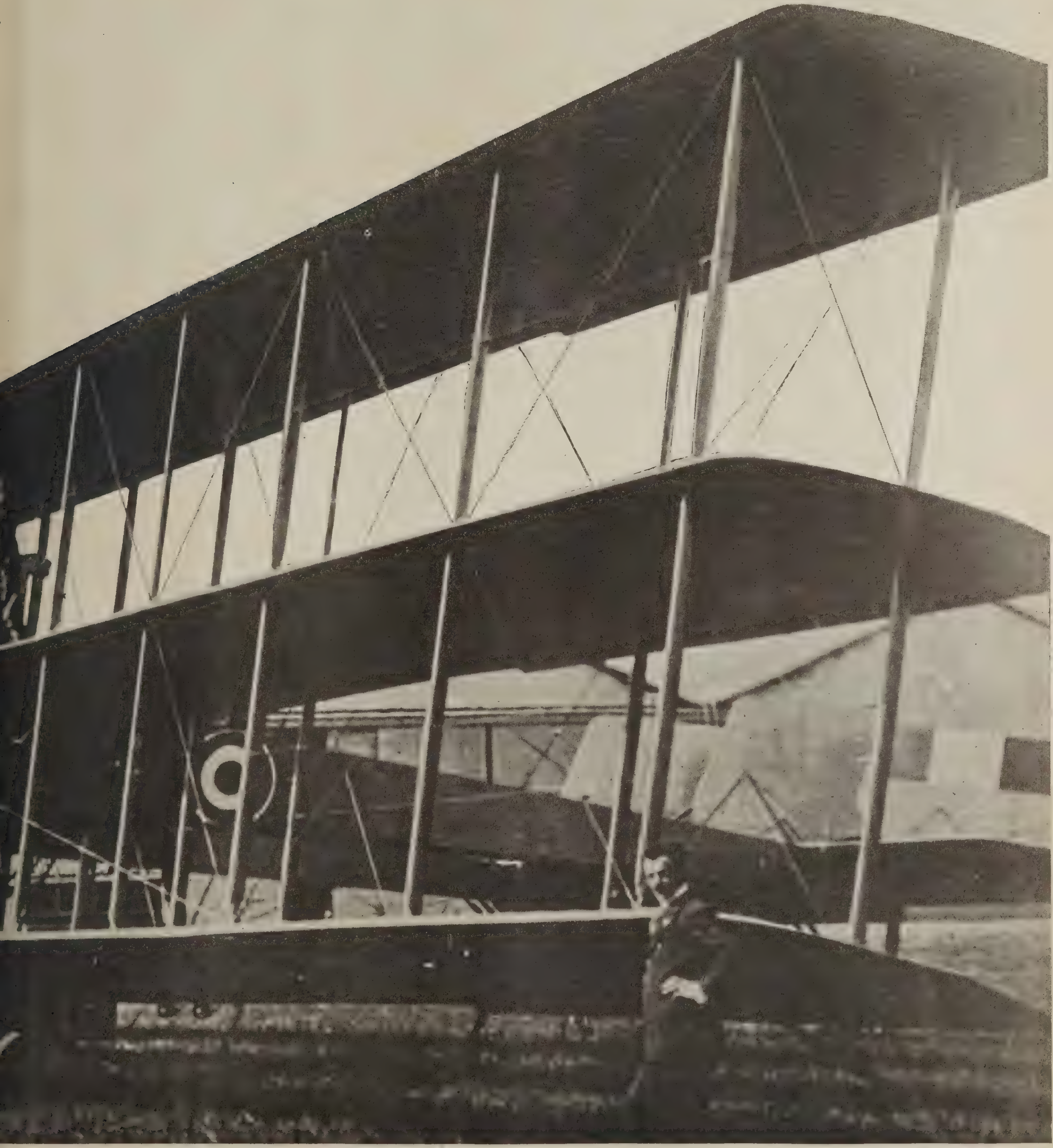
View of the body assembling and covering department of the Ansaldo factory, one of the largest Italian aeroplane factories

this, when Italy at the beginning of the war possessed not more than 100 aeroplanes and less than 100 pilots!

Italy is ready and proud today to put at the complete disposal of the American Government all that which she has accomplished in the aviation field; all of her experience, all of her knowledge and highest results, won through long and hard sacrifices, is at the command of the United States.

This is the least we can do to prove our everlasting and deep gratitude to this generous and glorious country for the benefits she has bestowed upon us.

A squadron of the famous Caproni Triplanes which have been doing such wonderful work in bombing the German and Austrian positions for over a year. (Official photograph.)



FOREIGN NEWS

FRANCE

The official report dealing with aerial operations issued to-night says:

"On August 15 our crews downed or put out of action twenty-three enemy aeroplanes. Thursday night our bombing squadrons made several expeditions behind the battle zone and dropped more than fourteen tons of explosives on railroad stations at Nesle and St. Quentin, and on bivouacs at Champion and Guiscard, where several fires were observed.

"Other expeditions flew over the valley of the Aisne and the region east of it and obtained excellent results. Four tons of explosives were dropped on the railroad station at Thionville and on the region of Mezieres and Charleville. A total of 25½ tons was used."

Paris, Aug. 18.—German air squadrons have been very active in bombing towns behind the front the past two days. There were numerous raids on Rouen, where six persons were killed and five wounded. The Gothas flew as far as Havre, where no damage was done. Two consecutive raids on Vernon caused only material damage. Several warnings were given at Dunkirk and Calais during the period. At Calais some fifty heavy bombs were dropped on Friday night.

Paris, Aug. 18 (Night Report).—Artillery fighting continued very spirited during the day, especially in the region of Canny-sur-Matz and Beuvraignes. Local actions south of the Avre enabled us to take more than 400 prisoners.

Aviation—Eight enemy aeroplanes have been downed or put out of action, and three captive balloons set afire. Our bombarding machines in the night of August 17-18 dropped seven tons of explosives on the railroad stations at Bazancourt and Amagne.

It is confirmed that on August 8 Second Lieutenant Boyau downed his thirtieth enemy plane.

The French official sttaement for August 19th on aviation says:

"During the 18th three German aeroplanes were brought down and one captive balloon was sent down in flames. On the night of the 18th-19th our bombing squadrons dropped eight tons of bombs in bivouacs in the region of Berry-au-Buc and Guignicourt and the railway stations of Mesieres and Chapelet-sur-Retourne."

German aeroplanes bombarded Nancy on August 19th. It is reported that six of the civilian population were killed and a score wounded.

GREAT BRITAIN

An Admiralty announcement says:

"British light forces, accompanied by aircraft rennoitered the West Frisian coast Sunday morning. The British forces were heavily attacked by German aircraft. Six motorboats have failed to return. There was no other damage, nor any other casualties.

"The aircraft attacked a German airship north of Ameland and destroyed it, bringing it down into the sea in flames from a great height."

"Work in the air was actively carried on in all its branches Aug. 12. On the battle front our balloons were pushed forward close behind the line and sent down much useful information. Our artillery and reconnaissance machines were busily occupied all day.

"Enemy aeroplanes were active and there was much air fighting. Thirty hostile machines were brought down and seven driven down out of control. One German balloon was shot down in flames.

"Forty-five tons of bombs were dropped by us during the twenty-four hours, the Peronne and Cambrai stations being heavily assailed.

"Twelve of our aeroplanes, including one night-bombing machine, are missing."

"On the night of Aug. 12-13 our air machines attacked a hostile aerodrome and trains, anti-aircraft batteries and searchlights and other ground targets with bombs and machine gun fire. All our machines returned safely.

"On the 13th the hostile aerodrome at Buhl was attacked. The results were not observed owing to bad visibility. Enemy aircraft, flying in large formations, were active on the battle-front. Twenty-nine hostile machines were destroyed in air fighting during the day and twenty-four others were driven down out of control. Four hostile balloons were shot down in flames. Five of our machines are missing.

The observation work for our artillery, carried out by aeroplanes and balloons, was steadily continued. On the night of August 10-11 a Gotha machine was brought down by our anti-craft fire, in addition to those already reported.

The British statement of August 14th reads:

The fine weather of Aug. 13 again enabled us to carry out a large amount of aerial work. The continual bombing of the Somme bridges, coupled with that of railway lines and junctions, which has taken place night and day since the beginning of the offensive, has interfered with the arrival of the enemy's reinforcements. It also has forced the enemy to employ large formations of air scouts in an endeavor to protect communications of much vital importance to his other arms, but concentrations of our air machines have effectively dealt with all opposition.

Fifty-eight tons of bombs have been dropped during the last 24 hours on the foregoing objectives, 21 tons by day and 37 tons by night.

A raid also was carried out on a hostile aerodrome from a low height by British and American aero squadrons. The raid resulted in six enemy machines on the ground being destroyed, and the hangars were set on fire.

In air fighting twenty-one enemy machines were brought down, and ten driven down out of control. Six of our machines are missing.

One of the most significant features of the aerial bombing offensive of the British is the loud response it has elicited from the German people, say British newspapers.

The bombing of England brought no complaint, but only renewed resolution; yet Germany, suffering the first preliminary pangs of British attacks, at once began to cry, and protest upon protest is pouring upon German authorities.

This means the British bombing offensive is effective; that far-reaching destruction has been caused to railway junctions and factories, and that German claims that British raids have accomplished nothing serious have been untrue.

Details of the damage caused by the British raids can easily be suppressed by the German censorship, and it is asserted there is abundant photographic and captured documentary evidence that the fears of the people are based upon real execution done.

The communication of Aug. 15 reads:

On the 14th inst. the activities of the enemy's airmen decreased somewhat, but our own machines carried out a great deal of reconnoissance and observation work and took many photographs. Twenty-two tons of bombs were dropped by us during the day, the principal targets attacked being Peronne, Roisel, the dump at Engel and the Bruges docks.

In air fighting, twenty-two hostile machines were destroyed and six driven down out of control. Fifteen of our aeroplanes are missing.

On the night of Aug. 14-15 the Somme bridges and the railways at Peronne, Douai and Cambrai were heavily bombed, a total of thirty tons being dropped with good effect. An enemy night flying aeroplane was brought down in flames. One of our night bombing machines failed to return.

"On August 15 the number of combats was not great. Four hostile machines were destroyed by our airmen and two German observation balloons were shot down in flames. Five hostile machines were driven down out of control. One of our aeroplanes is missing.

"Much reconnaissance work and a good deal of observation for artillery fire was successfully accomplished during the day. The total weight of bombs dropped by us in the course of the twenty-four hours amounted to 22½ tons. Two German aerodromes were heavily attacked, as well as several of the enemy dumps and railway connections. All our night bombing machines returned safely."

Sixty tons of bombs were dropped by British raiding machines on the German submarine bases at Zeebrugge and Ostend on August 15th, the Admiralty announced. Other military objectives also were attacked. Six German aeroplanes were destroyed when the aerodrome at Varssenacre was bombed. A direct hit upon a German destroyer off the Belgian coast was scored, followed by an explosion.

British aircraft brought down thirty-one hostile machines and one balloon, losing only three of their own machines.

The following communication on aerial operations was issued on August 17:

"On August 16 the weather continued fine, but the enemy's aerial activity was not great. Twelve hostile machines were brought down by our airmen and two were driven down out of control. Six of our machines are missing. Another hostile machine was brought down during the night.

"The hostile aerodromes of Haubourdin and Lomme were heavily attacked on the mornings of the 16th and 17th by a large number of our machines. Bombs were dropped from a low height, and at the former aerodrome six hangars were demolished and two machines standing in the open were destroyed. Three hangars were destroyed at the latter aerodrome, and at both places the living quarters were heavily fired on, and several fires were started.

"More than forty tons of bombs were dropped by us during the twenty-four hours.

"On the night of August 16-17 our air squadrons attacked four hostile aerodromes and two railway junctions. The visibility was very poor and observation of the results was difficult.

"In addition to the two British machines reported missing on August 16, a third machine has failed to return."

Thirteen enemy aeroplanes were destroyed in combat August 17, according to the reports of the French and British War Offices. The British assert that they brought down five enemy machines and that three of their own machines are missing.

Bombing raids by both the British and the French are being continued against the German rear lines. The British report thirteen tons of bombs dropped.

German squadrons have been active in bombarding towns behind the front during the last two days. There were numerous raids on Rouen, where six persons were killed and five wounded. The German Gothas flew as far as Havre, where no one was killed and no damage done. Two consecutive raids on Vernon caused only material damage.

Several warnings were given at Dunkirk and Calais during the period. At Calais about fifty heavy bombs were dropped.

The Air Ministry issued this statement on August 19:

"On the night of August 18-19 our squadrons attacked hostile aerodromes and landing grounds. Various ground targets were also attacked with machine gun fire. One of our machines has failed to return.

"On August 18 we brought down six hostile machines and shot down a German balloon in flames. One of our aeroplanes is missing.

"Sixteen tons of bombs were dropped by us during the day and the following night on different targets."

The official communication on aerial operations, issued August 20, says:

"Early in the morning of August 18 some of our squadrons combined in a very successful attack on the Phalemrim aerodrome, south of Lille. Many bombs were dropped from a low altitude, and machine guns were used with good effect on ground targets. Several aeroplane sheds were hit and big fires started.

GERMANY

The official report received August 16th from Berlin dealing with aviation says:

"Yesterday we shot down twenty-four enemy aeroplanes."

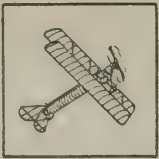
On August 20th: "In nocturnal flights our bomb squadrons successfully attacked with bombs and machine gun fire the adversary who was densely concentrated in villages and on railroads and highways."

A War Office announcement issued August 17 says:

"Our chaser aeroplanes shot down four large English battleplanes that attacked Darmstadt with bombs."

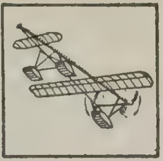
ITALY

The War Office statement of August 16 reads: "Four hostile aeroplanes and a captive balloon have been brought down."



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

COMPRESSED AIR MOTOR

THE Compressed Air Motor is the simplest of the reciprocating type of motor and the one described in this article is the simplest of this type and by far the easiest to build. This motor was designed to eliminate all the difficult parts generally found in motors of this kind and can be made by the use of such simple tools as a vise, drill press, file and a small soldering outfit, using illuminating gas, which will be illustrated in another article. (I would advise the model builder waiting for the next article, before starting on this motor, as it will contain illustrations of a mouth blow torch, improvised lathe, etc., for building this engine.)

The motor herein described has successfully flown a model aeroplane and is the lightest practical compressed air motor ever made; its weight is 1½ ounces. This saving in weight has been accomplished by doing away with the usual heavy crankcase, double bearing crankshaft and valve construction. You will note that in this motor the propeller shaft acts as the crankshaft distributing air intake and exhaust release.

I would advise the model builder to study the drawing carefully before building the motor, in order to get a fair idea of just what it will look like when built, otherwise you will have trouble in assembling. When soldering use as little solder as possible especially on the working parts, otherwise solder will run in and "freeze" the parts together.

To construct the motor make the cylinder and crankcase part first. This is made from the "Female" part of a fishing rod ferrule. These fishing rod ferrules can be purchased at most hardware stores or any fishing tackle store. When purchasing ask for a number 9 or ⅝″ ferrule, and be sure that the male part has a closed end, as this part is used for the pistons. It will be necessary to buy two male parts, as it is necessary to have two pistons.

The part marked "OFF" is cut off with a small key filed, and then the space for the crankshaft is filed or cut with a fine hacksaw, then drill a 5/16″ diameter hole at a point midway between the two ends. Two discs of thin metal with holes ⅛″ in diameter are soldered in each end to form cylinder heads.

The two pistons are made from the top parts of the "male" ferrule, as in Figure 2, the parts marked "OFF" being discarded as before. The pistons are ⅜″ long and are shown in Figure 3. The hole in the top is 3/16″ in diameter and is for what we shall term the "wrist pin" or terminal for the connecting rod.

The cup washer is used on top of the piston to keep the air from leaking past the piston. It is much the same as the washer used in a bicycle pump plunger, made from a disc of thin soft leather ¾″ in diameter, and soaked in oil to make it more pliable, and shaped as shown in Figure 4 to fit in the cylinder.

Two connecting rods are made of ⅛″ brass tubing 1⅜″ long flattened at the ends by hammering (after bringing it to a red heat over a flame to make it softer) and drilling holes, ⅛″ and 1/32″ in diameter at the ends as shown in Figure 5.

The "wrist pin" or connecting rod terminal is made from a 3/16″ brass bolt as shown in Figure 8. The assembly of the piston, cup washer and connecting rod is shown in Figure 6. The connecting rod is fastened to the 3/16″ brass bolt by filing a slot at one end and drilling a 1/32″ hole through the forked ends; the small hole of the connecting rod is then placed in between the fork and a piece of wire or a nail 1/32″ thick is shoved in place and riveted, but loose enough to allow the connecting rod to move freely. A nut is then screwed on the bolt as shown in Figure 8. The bolt is next shoved through the hole in the piston, and the cup washer put in place. A disc of very thin metal about ½″ in diameter should be put over the cup washer to hold it firmly in place when moving up and down in the cylinder. The top nut is then put on and the bolt cut off close to the nut, after making provision for the guarding of the nut working loose when the engine starts running. This can be done by hitting the portion of the bolt extending over the nut, a few taps with a hammer forming a sort of rivet. This makes up the piston and connecting rod assembling (see Figure 6).

The crankshaft is made up from a taper pin, piece of flat steel and a piece of ⅛″ drill rod. The stud or crank pin in Figure 9 is made from a ½″ piece of ⅛″ drill rod, the largest diameter extending for ⅜″ then ⅛″ or 1/16″ diameter. This small part can be made by a file or on the improvised lathe appearing in the following article.

The crank throw is made of 1/16″ steel ⅝″ long to the shape of the Figure 10.

The shaft, Figure 11, you will notice is tapered. This is what is known as a number 2 taper pin 2″ long, and can be purchased at a hardware store. The slots are filed out to the sizes and distances shown. They are 1/16″ deep.

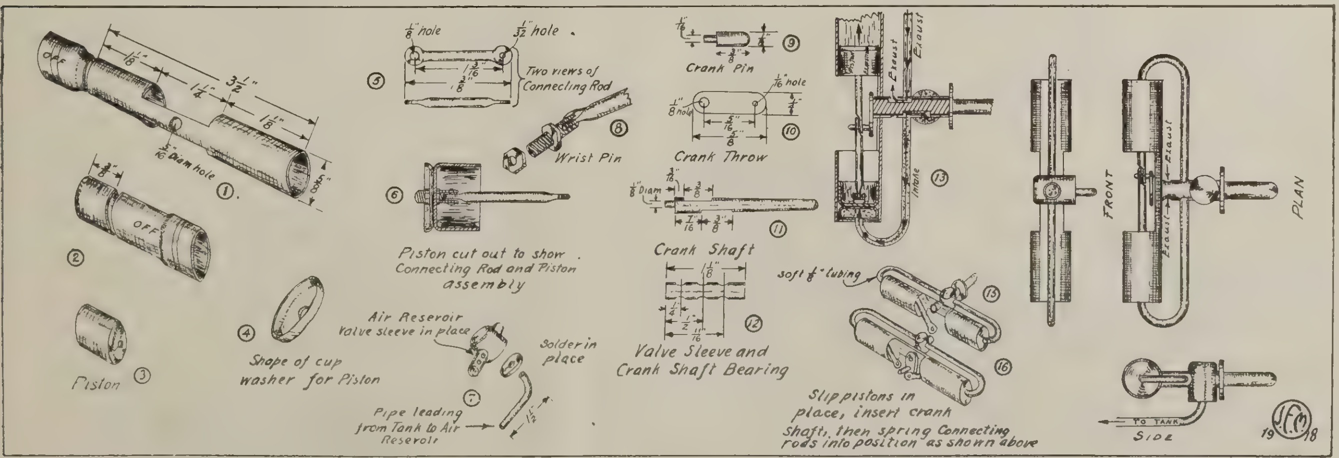
When these parts are finished, the end of Figure 11 should be placed in the ⅛″ hole of Figure 10 and riveted. When in position the flat piece in Figure 10 should be extended in the direction of the slats of the shaft. *Not* as shown in the crankshaft assembly in Figure 13, which is only done this way to show the working of the engine.

The stud, Figure 9, is next put into place, the small end inserted into the 1/16″ hole of the crank throw and riveted.

The outside of the valve is made from a heavy walled 5/16″ outside diameter brass tubing. 1/16″ holes drilled along straight lines directly opposite each other and the distances apart show in the Figure 12. Before cutting the tubing to the length given, it should be reamed out with a Number 2 Tapered Reamer to fit the Number 2 Taper Pin. This is bought in a hardware store for a small price, as is the handle used for it. The reamer is used to cut an inside taper in the tubing to allow a snug fit of the crankshaft. Care must be taken to do this job right otherwise this valve will leak and the engine will lose considerable power.

When reaming, the crankshaft should be inserted from time to time until the flat piece in Figure 10 just touches the tubing. Take care not to get the hole reamed too big.

(To be continued)



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Wings. Solo

No more foot-slogging on the pavé or in the mire
Never again shall I curse a pack that jams in the communication trench,
My route is above the charging clouds, thank the kind heavens,
With no panting corporal to make me double on the duckboards,
Close to the wine-dark blue ceiling of the uttermost air,
Where the morning Archies sing together,
And the great howitzer shell slowly rounds off his dreadful arc.

No dirty dug-out smash for me,
Mine's a clean death when it comes;
But before then I'll put "paid" to a few Hun accounts,
Dive to see 'em crash,
And drop 'em a wreath next week.

Hey for the steep-climbing spiral,
With the contented engine-purr for abbligato.
Heart leaping. Every pulse dancing.
And no care for the wind-pocket, and the sudden lurch and drop,
I've a super-seaman stomach for the giddy plunge, thank the stars!

What does she say? Ninety?
Here's for a few more revs.
Ease her. Pull the stick. Let's have a purler or two.
Oh, the queer whirling green world with the gray ribbons of road,
And the feebly-crawling dots of unwinged folk,
Little laboring ants with their straw-burdens——

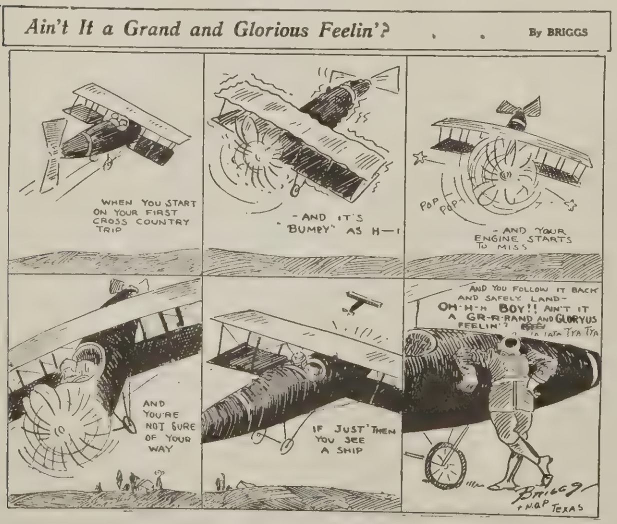
Steady again.
Is it the wide earth between my knees, or the white-piled cloud?
Start her up. Make a bit more height.
See the steel-track below grow narrower,
The little idly-puffing loco. jet tinier steam-cloud,
And creep vainly after me on my way.
See the fieldlets contract, and the earth-bowl grow rounder,
Till the far-off edge of the land comes in ken,
And the dazzling fringe of winking purple-shot sea jumps to my eyes.

Now for a whirling swoop and dive to finish.
There's a swift check for an eager leaping heart.
Whoosh——What a wind pressure.
Flatten. Start her up. Lift her a bit.
She taxies gently. That's what I call a landing.

All clear, sir . . . engine of the sweetest.
(Not a stammer or a tremor.
Hooray for a steady tongue.)
I shall make a scout for sure.
I'll spit swift death soon to the overdaring Hun that doesn't know his limits.
I shall zoom till my bullets buzz in his thick gross ears,
And see his climbing planes rush for a safe landing,
Like pigeons that scatter when the hawk swoops suddenly, dreadfully,——

But now for a bath. And this evening for rehearsal.

Signals.


Ain't It a Grand and Glorious Feelin'? By BRIGGS
WHEN YOU START ON YOUR FIRST CROSS COUNTRY TRIP
-AND IT'S "BUMPY" AS H—!
POP POP
-AND YOUR ENGINE STARTS TO MISS
AND YOU'RE NOT SURE OF YOUR WAY
IF JUST THEN YOU SEE A SHIP
AND YOU FOLLOW IT BACK AND SAFELY LAND-
OH-H-H BOY!! AIN'T IT A GR-R-RAND AND GLORYUS FEELIN'?
TA TATA TYA TYA
BRIGGS
N.Q.P TEXAS

Courtesy N. Y. Tribune

The Limit

Eleven o'clock! and all was still,
The moon had risen o'er the hill,
It seemed like "nothing doing."
But when the C.O. sent for me
My instinct could not fail to see
That there was trouble brewing!

"Go down to Hants," said he, "by air;
The night is clear, the heavens are bare,
And you'll enjoy the journey.
Take these despatches with you—see?"
And, saying thus, he blinked at me
Like some cross-eyed attorney!

O Sleep! when wilt thou come again?
Last night, I flew to Salisbury Plain,
And now I'm bound for Beaulieu.
These flying stunts are jolly fine,
But this is where I draw the line,
My soul becomes unruly.

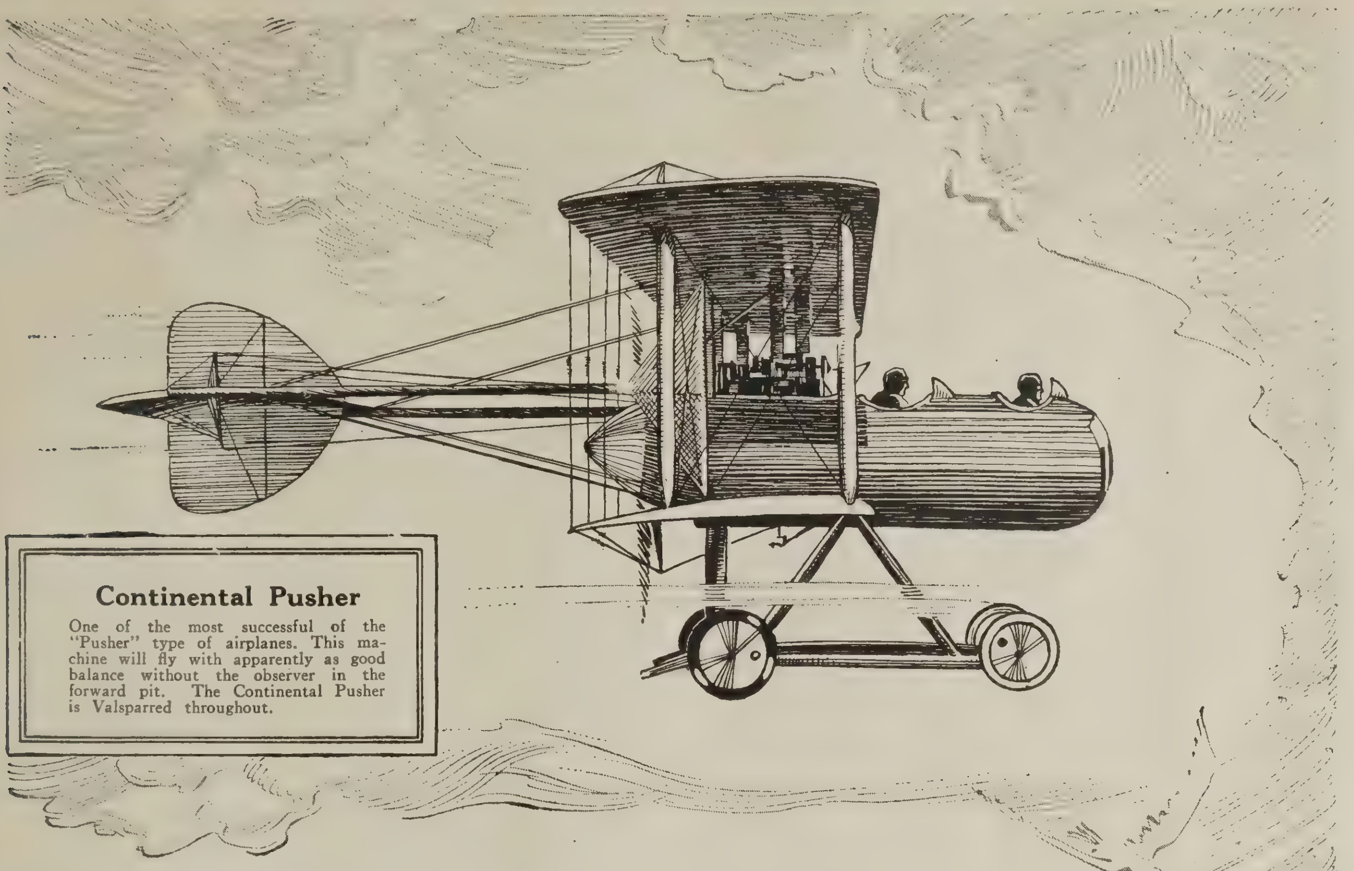
But discipline one can't evade,
So in my fur-lined coat arrayed
I started in my Sopwith.
She was a single-seater 'plane.
Alas! I felt that I would fain
Have some one to talk shop with!

"The night is clear," the chief had said;
But now, dark clouds swarmed overhead
And fog-banks in a quarry.
My hope, my nerves, my cap were gone,
But recklessly I blundered on,
And whistled "Annie Laurie."

The rain came down—and so did I!
I thought it meant a fond good bye;
But soon I got her righted.
Then on I went for hours and hours
Mid gusts and currents, storms and showers,
Until my goal was sighted!

"Oh, sergeant! what a ghastly ride!
Pray take these documents inside.
Night-flying I disparage."
The sergeant stared at the address,
Then, grinning, said, "Wrong shop, I guess!
This station, sir, is—Harwich!"

G. R. S.



Continental Pusher

One of the most successful of the "Pusher" type of airplanes. This machine will fly with apparently as good balance without the observer in the forward pit. The Continental Pusher is Valsparred throughout.

The latest types of Aircraft are Valsparred

Valspar is used to protect airplanes and seaplanes because it has proved its high efficiency in long and arduous service.

Training-machines, American coast air-patrols, battle-planes on the Allied fronts, and practically every other type of military and naval flying craft are Valsparred.

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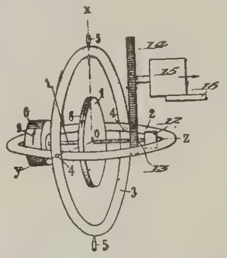
RECENT AERO PATENTS

BY WILLIAM N. MOORE

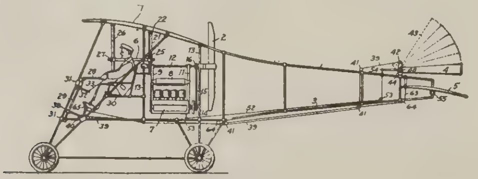
1,180,365. METHOD OF GYROSCOPIC CONTROL. Herman M. Anschutz-Kaempfe, Neumühlen, near Kiel, Germany. Filed Jan. 3, 1912. Serial No. 669,264. (Cl. 114—24.)



1. In torpedoes adapted for ejection from a torpedo tube and provided with a rotary, cardanically suspended wheel, the method of control which comprises rotating the wheel at a predetermined speed while the torpedo is being ejected and while the gyroscope and torpedo are fixedly locked together, and in subsequently after the gyroscope is unlocked materially increasing the speed of rotation of the wheel electrically, for the purpose specified.

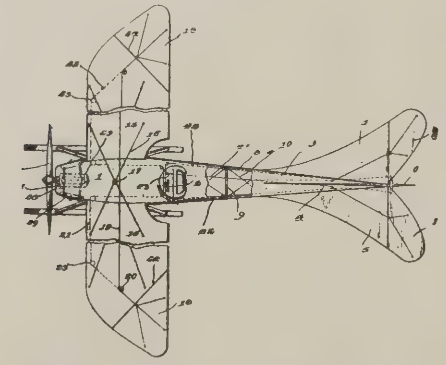
2. In torpedoes adapted for ejection from a torpedo tube and provided with a rotary, cardanically suspended wheel, the method of control which comprises mechanically rotating the wheel at a constant speed as the torpedo is being ejected and while the gyroscope and torpedo are fixedly locked together, and in subsequently after the gyroscope is unlocked materially increasing the speed of rotation of the wheel electrically for a predetermined time, for the purpose specified.

1,174,679. AERIAL VEHICLE. Clarence W. Carroll, Rochester, N. Y., assignor of two-tenths to Farnum F. Dorsey and three-tenths to C. Schuyler Davis, Rochester, N. Y. Filed Mar. 12, 1910. Serial No. 549,043. (Cl. 244—29.)



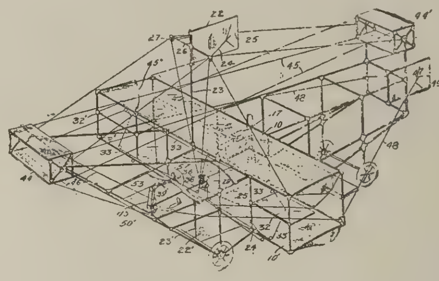
1. An aerial vehicle having, in combination, means for steering the vehicle horizontally, controlling-means co-operating with the steering-means and operative automatically to control the direction of operation thereof, and manually operable means connected with the steering-means and operable to throw the steering-means into operation in the direction determined by said controlling-means.

1,176,593. MONOPLANE. Stephen F. Naughton, U. S. Navy. Filed Feb. 12, 1915. Serial No. 7,890. (Cl. 244—14.)



In a flying machine, the combination of a hollow body or nacelle having a suction opening in the front portion and sets of discharge openings in the side portions of its bow, a supporting surface carried by the body, suitable steering and stabilizing means, a motor positioned in the bow of the body and having its shaft extending forwardly through the suction opening, radiators at the sides of the bow of the body having suction producing vanes projecting outwardly through said discharge openings, so as to lie in the path of the wind and directly in the path of the air from the propeller, whereby a suction is produced within the bow to draw cooling drafts of air thereinto through the suction opening and discharge the same through the said side discharge openings, and conductors extending between and connecting the radiators with the water jacket of the motor.

1,180,271. AIR-CRAFT. John P. Tarbox, Washington, D. C., assignor to Tarbox Safety Aircraft Company, a Corporation of Delaware. Filed Feb. 10, 1911. Serial No. 607,735. (Cl. 244—29.)



1. In combination an air-craft, a vertical laterally deflectable balancing plane a certain distance above the craft, a similar plane of the same effective area a different distance below the craft, and means for simultaneously deflecting the said planes in opposite directions, the areas of said planes being in the ratio of said distances to each other.

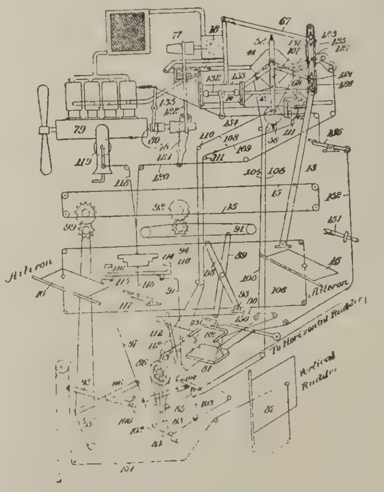
2. An air-craft comprising a main supporting surface, balancing means, lateral steering means, means for operating the balancing means, means for operating the lateral steering means, and a lost motion connection between said two operating means.

3. In an air-craft, laterally balancing devices, means for operating the same, lateral steering means, means for operating the same, and a mutilated gearing connection between said two operating means.

4. A steering gear comprising a fixed vertical rotable post, a lateral steering rudder connected thereto for operation through rotation of the post, a substantially vertical lever hinged to said post, elevating planes connected to said lever, a horizontal lever hinged to said vertical lever, and balancing devices connected to said horizontal lever, said horizontal lever being adapted for movement to control each of the several steering devices connected to the mechanism simultaneously.

5. In an air-craft, the combination with a supporting member, of a pair of balancing surfaces each pivotally mounted in a vertical plane one above and the other below said supporting member, and an interlocking connection between said surfaces permitting their simultaneous movement in the same direction under influence of lateral air pressure.

1,180,275. BALANCING MECHANISM. John P. Tarbox, Washington, D. C., assignor to Tarbox Safety Aircraft Company, a Corporation of Delaware. Filed Nov. 14, 1911. Serial No. 660,249. (Cl. 244—29.)



1. In an air-craft, a motor for driving the same, means for changing the speed of the motor, an automatic balancing mechanism driven from the motor, balancing devices operated by the balancing mechanism, and changing means associated with the balancing mechanism and operatively connected with the means for changing the speed of the motor whereby the relative speed of operation of the motor and balancing mechanism is changed.

(*Continued from page* 1214)

As early as October, 1917, at an international conference in Paris concerning a general aviation program, the Italian inventor, Caproni, was summoned to meet Col. Bolling, one of the heads of the aviation section in Paris. An arrangement was ultimately made by which Capt. D'Annunzio and a force of workmen and engineers were to be brought to America to produce in American plants Caproni machines. Capt. D'Annunzio and 19 of the best men of the Italian factory arrived in the United States on January 17.

In January, 1918, the Standard Co. was given a verbal order for 1,000 Capronis, 50 to be assembled and 950 to be sent overseas knocked down. Drawings were prepared, but no official order was given for the machines.

On January 25 Capt. D'Annunzio and his men came to the plant, began work on a handmade machine. A witness describing the transaction states that—

"They (the aeroplane authorities), in February, began to back and fill on whether they were going to build Capronis in quantity, and by March 2 it was practically settled that they would not build Capronis in this country at all, except the ones we were working on and two or three for experimental purposes.

"As a result of that we took the Handley Page as a substitute."

Capt. D'Annunzio states that he had expected upon his arrival in this country that everything would be ready. "They were wiring and cabling Italy, asking for the engineers of the Caproni plant. I requested Gen. Tozzi, who is head of the Purchase Mission, in Washington, to help me clear up the matter. So we provoked a lot of meetings between myself, Col. Deeds, and some other officers. * * * It was just the same as before, because no decisions were reached. * * * I found they were undecided as to whether they should make that machine, although demonstrations had been given before the European military mission," etc.

Finally Capt. D'Annunzio was authorized to build the first experimental machine for American engineers. That machine was finished and flown on July 7. In the meantime, and about April 12, the Fisher Body Co. obtained an oral contract for 250 Capronis, which was later canceled. Again, about May 18, 1918, the Curtiss Aeroplane Co. was given an order for 500 Capronis, and on the same day the Fisher Body Co. was given an order for 500 Capronis. It is understood, however, that nothing will be done to carry out this order until the experimental machine has been tested out. This precaution is proper.

During the interval of delay both of the Italian pilots who came to this country were killed in other machines, and the Caproni program is now awaiting the arrival of Italian pilots and the testing of the experimental machine.

Over 12 months of time has been thus consumed since the Caproni came under serious consideration.

Plans for the Handley Page machine were supplied to the Signal Corps in the summer of 1917 by the owner, with full permission to use them. Its engineers made a number of changes in them, beyond which nothing was done with them. Hence, the representative of the owners in the early winter demanded their return. They were delivered to him as changed.

In February last contracts for 1,000 sets of parts, afterwards reduced to 500 sets of parts, were made with various contractors, to be assembled in Great Britain for the use of the American Army. From 60 to 90 days are required for the assembly of a Handley Page machine. Twenty of these have been embarked, and we are informed that they will continue to go in constantly increasing quantity, reaching 140 for the month of February. Had these contracts been let last October they could have been completed and delivered by the 1st of July.

One sample machine constructed by the Standard Aircraft Corporation was completed and given its initial flying test on July 6 last. If further tests prove satisfactory the design will go into quantity production. Had the machine been ordered last summer it should be in quantity production now.

The production of training planes has been fairly adequate. One type, the Standard, of which there were 1,200, has recently been discarded because the Hall-Scott engine which drives it has proven unsatisfactory, but there is no reason to apprehend that training plane production will fall below the requirements of the service. The designers and manufacturers of this plane insisted that with a good engine it is all right, and this insistence will be tested. If successful they can be made available hereafter. But Gen. Kenly and his assistants found them highly dangerous because of the motor and ordered their retirement. The machines cost the Government about $6,000,000.

The De Haviland 4

The De Haviland 4 is the only so-called fighting plane now in actual production. Outstanding contracts call for 8,500 of them. They are being manufactured by the Dayton-Wright and the Fisher Body companies, with smaller contracts to the Standard and one or two other producers. On August 1 a total of about 1,000 of these had been delivered, all but a few of which had been turned out by the Dayton-Wright concern.

The first plane of this type was embarked for France during the latter part of February of this year, but never reached port. Up to July 1, 286 had been shipped abroad, of which 67 had reached headquarters in France. On August 1, 601 had been embarked. A number of them were delivered to Gen. Pershing's headquarters in June, and upon inspection were found to contain many defects, some of which were serious, others of less importance. Under date of June 26, Gen. Pershing cabled the War Department enumerating many defects and stating explicitly that the machines could not be used until some of them were corrected. Also that all planes of this class should be thoroughly tested and inspected before being shipped to him. This obvious requirement Gen. Kenly had insisted upon observing, but sent them over in the instance considered without doing so because of an overseas order requiring it.

Some of the defects enumerated in this report, in the opinion of every expert flyer, who has been examined by the committee, rendered the machines more than ordinarily dangerous. Their opinions differed as to whether or not corrections can be made to make the machines safe, but the assertion that the plane is very unsafe in the condition in which it has been up to this time delivered from the factory was practically unanimous. Deliveries of the machine continued notwithstanding, and many were sent to France in precisely the condition complained of in Gen. Pershing's cable. The explanation offered for continuing delivery of these defective planes is that the corrections could be made overseas, and a force of American officers and mechanics under command of Lieut. Col. Hall was dispatched to France about the middle of July with orders to make them. Your committee is of opinion that the planes should never have been permitted to leave the factory in their defective condition, and the fact that they were permitted to go shows either a lack of appreciation of the situation, a disregard for it, or a very poor system of inspection. On August 2 an order was issued to all the factories directing that no more of them be delivered until the corrections required were made. We are informed that production under these new conditions is about to be resumed.

In July 155 of these planes were delivered to the Navy, about 50 of which were shipped abroad and approximately 100 crated and delivered at the seaboard for shipment. At this stage four of them selected from the lot were sent to the Navy testing field at Miami, Fla. A test and inspection there revealed the same defects that were reported by Gen. Pershing and some others. The commandant, Capt. McCaughtry, immediately reported this fact to the Navy Department, with the result that a cable was sent to Admiral Sims apprising him of the defective condition of those previously sent, while the 100 in crates at the port of embarkation were rejected and returned to the Aircraft Board.

Forty De Haviland 4's sent to a Long Island Field about this time and tested out in the vicinity of New York were pronounced structurally weak and defective. With the production of the De Haviland 4 it has been the same story of changes. Many of these have been made in the plane since the board determined upon its manufacture. Some were unimportant, some extremely so; many of them undoubtedly necessary to its adaptation to the Liberty motor. But they have been made for the most part by automobile and mechanical engineers, having little or no experience in aviation engineering.

On the 28th, 29th, and 30th of July three squadrons of 18 machines, each 54 in all, having been overhauled by American and French mechanics at an American aviation base behind the French lines, were delivered to the front under their own power. These planes are said to have received the approval of Capt. de Haviland after a careful inspection. Assuming this to be true, it indicates that the machines sent over have been carefully inspected and the defects remedied. On August 7 one squadron of these, comprising 18 machines, under command of Gen. Foulois, made an expedition across the German lines and returned in safety to their base. This marks the date of the use of the first American-built plane over the enemy's lines. The committee has no information regarding the character of their performance.

The character of the evidence concerning this machine, ranging from qualified approval to severest condemnation, shows that the De Haviland 4 is chiefly available for observation or reconnoissance purposes. That the War Department and the Aircraft Board share this view is best evidenced by the fact that it is to be replaced by a machine of later design as speedily as may be possible without complete suspension of production.

With the exception of the S. E. 5 and the Handley Page, in parts, no other type of fighting plane can be produced in quantity before 1919.

The U. S. D. 9 plane is a redesign of the British D. H. 9, being a great improvement on the D. H. 4. But the U. S. D. 9 has not yet fully responded to the tests of the military bureau and will go into production only when it does so. The U. S. D. 9A, another and later design, now under test, promises to be a satisfactory machine. If the promise is fulfilled by the tests, the design will be adopted and substituted for the De Haviland 4.

Recognizing the fact that the United States would not produce planes in quantities early in the war, the board contracted with the English and French early in 1917 for a supply of fighting planes. Of these, 2,114, according to the latest testimony we were able to receive, have been from time to time delivered. This enabled us to maintain 13 squadrons of 18 fliers each on the front, a force which is wholly inadequate to meet requirements of modern warfare. It should also be stated that as our troops are moving to France in great numbers, the disparity may increase until we get into quantity production. It is proper to call attention to the fact that at an investigation of the War Department by the Military Committee, held in January and February, 1918, the committee was assured that the French could and would furnish all the combat planes we needed, provided we would send them the raw material, and that this material was being furnished. This assurance was given when the committee showed anxiety at the continued delay in the shipping of planes.

In January Gen. Squier and Col. Deeds testified to this fact and Secretary Baker gave similar assurance to the committee. The facts, however, are as shown by the testimony of Gen. Kenly, given on July 20, that the plan failed for two reasons. We quote his testimony:

"The French contract practically fell down, as you know. * * * It was due to what I consider two reasons. In the first place, the contracts with the French were dependent upon the sending of raw material that was to be furnished by us, and we did not live up to our agreement. * * * In the second place, the increase in German activities in the air caused a change of program in French aviation construction. * * * The French contracts fell down, so that we became more or less dependent upon what could be furnished on this side."

Besides this, many of the machines our men are now forced to use in France are unsatisfactory, but not more so than those used by the French themselves. An Army officer recently at the front testified that the American troops are using many antiquated machines purchased from the French that were discarded by them a year and a half ago. They are using the Sopwith, 1½ strutter, which has been declared unsafe by the French and British for observation work. They are using the A. R., equipped with Renault 220, which has a ceiling of only 10,000 feet. They use a Spad two-seater, which is unreliable and unsatisfactory. They were using a few French Briguet machines and the Salmson, which is a French machine. It is reassuring to reflect that all commands are unified in France, with all lines of the service under a common protection.

The Liberty 12-cylinder engine is an excellent one for the heavier planes and certain other purposes. Its weight of 825 pounds and its 400 horsepower makes it too heavy and too powerful for the lighter types. It is not yet perfect, but it is improving under repeated tests and experiments, which disclose defects for elimination and suggest changes and readjustments of its parts. It is now in quantity production, more than 4,000 having been delivered, and is approved by our allies, who are anxious to obtain more of them than we can at present supply.

In the development of this motor the Aircraft Board has performed an important task, for which due credit should be given. But the announcement that it had been evolved in a few days was unfounded, and the notion which was encouraged that it could be used for planes of all sizes and character was largely responsible for delays to our plane program.

Motor production has proved to be a formidable task, magnified in some degree by the reluctance of the designers to promptly accept and act upon suggestions of imperfections from competent engineers and critics and fliers and make changes in conformity with them.

The manufacture of the best foreign motors, among which are the Rolls-Royce, Hispano-Suiza, and Fiat, contemporaneously with the development of an American engine would have been the sounder policy. That it was partially adopted later confirms this conclusion. We are doing what should have been done a year ago and are producing the 150 and 180 horsepower Hispano-Suiza motor in quantity. Deliveries of the Le Rhone, Bugatti, and 300-horsepower Hispano-Suiza will follow.

American concerns are making the Rolls-Royce motor for the British Government and should long since have been making them for ours. The smaller types of Hispano-Suiza are serviceable for the lighter and faster planes. In view of these conditions, the apprehension of a year ago that we could not produce foreign motors in quantity because of their metrical measurements and intricacies of construction, requiring manual instead of machine work, which we did not possess, becomes untenable.

No fighting plane of American or other design has been built around the Liberty engine, although it is an axiom in aeronautics that planes must be adapted to motors. The Aircraft Board authorized some attempts at this all-important work, one by Capt. La Pere and one by Col. Clarke, the first of which is being tested and developed by the board, with good prospects of success. This should have been done before, as the type must be made effective before the best performance of the Liberty motor can be secured. A Curtiss design also gives promise of satisfactory results in the near future. The motor can be used in some other models with good results, but until a Liberty plane is successfully built around a Liberty motor by competent aeronautic engineers and thoroughly tested out our air program will not be complete.

Inspection

The Signal Corps inspection system has paralleled that of the producers. In some instances it has functioned badly, with the result that defective material has at times been accepted and material condemned and reported to chief inspectors has found its way back to the producer. In some factories the finished product has been accepted, although not up to requirements. Generally speaking, the production and inspection systems of the manufacturers seem to be more co-operative than competitive. We have found no collusion between the official and the private inspector, but the inspection in the past has been bad. The faults of the system are in part due to the incompetency of the inspectors. We are informed that the system has undergone and is now undergoing a radical transformation and is being remedied as rapidly as skilled and efficient operators can be secured.

Training and Testing Fields

The training fields are each designed for 600 enlisted men, 300 cadets, and 72 officers, a total of 972 men, which, owing to the exigencies of the service, have at times been exceeded. This arrangement requires a total of 54 structures of all sorts for each standard field. In addition to these, there are repair and supply depots, balloon schools, experimental stations, radio laboratories, warehouses, quarantine camps, temporary barracks, photograph schools, etc.

Up to May 25, last, there were 31 fields, including balloon schools and experimental stations, and 37 miscellaneous projects comprised in the above recital, not including the training schools at various State and other universities, nor projects recommended but not yet approved by the War Department. Their estimated cost is $52,511,134, of which $39,356,407 have been expended, exclusive of a field at Miami, Fla., established by Col. E. A. Deeds, a member of the board, on his own responsibility (and without the knowledge or sanction of the head of the equipment division having charge of the work), and a night flying route from Dayton, Ohio, to Rantoul, Ill., by way of Indianapolis. The cost of these extra projects was over $400,000. This night flying route was used for the first time on the night of August 12 between Dayton and Indianapolis, and was pronounced satisfactory by Gen. Charles E. Lee and Capt. J. Fitz Morris, of the British air service, and the aviators who made the trip.

The Equipment Division had some difficulty in securing material for construction prior to the advent of Mr. W. C. Potter, now assistant director of the Production Board, since which time there has been much improvement.

The contractors for the work at Langley field and the fields at Dayton were not satisfactory. Upon the whole, the work of construction proceeded fairly well and the structures on most of the fields have been completed.

Langley Field, near Newport News, Va., consisting of 1,650 acres, was selected prior to our entry into the war for a training and experimental field. The estimated cost of its needed buildings, not yet completed, is $3,664,050, of which $2,305,697 have been expended. It seems to have been wisely chosen and well fitted for testing and experimental work. Nevertheless, it was practically abandoned last year for that class of work, and McCook Field, at Dayton, Ohio, consisting of but 200 acres, and practically enclosed by river, trees and telephone and telegraph wires, was selected instead and leased at an annual rental of $12,500. The reason assigned to the committee for this change was the lack of transportation facilities at Langley, although a spur connecting it with nearby railway systems had been constructed by the Government for its express accommodation prior to the transfer. The insufficiency of this reason is emphasized by the fact that about the same time the board selected the Wilbur Wright training field, near Dayton, requiring the construction of a trolley line by the Government, at a cost of $175,000, which is its only line of transportation. The field is now being used by the Bureau of Aeronautics for its military testing plant. McCook Field is not only too small for satisfactory experimental flying, but its environment is unfavorable to its use for that purpose. The board has, however, equipped it with structures costing $920,100.

Adjoining the Wilbur Wright Field is a large warehouse built at a cost of some $500,000. In this warehouse are stored great quantities of supplies, many of which, like machine guns, radio batteries, photographic accessories, etc., are manufactured in the East. To send them hundreds of miles west for storage, reshipping them over the same route back to the seaboard when needed for over-seas uses, is waste. It needlessly adds to railway congestion and should be corrected.

Your committee visited but a few of the training fields, of which Wilbur Wright Field, above referred to, was one. It comprises 2,200 acres and belongs to the Dayton Conservancy Association, and is designed as a part of the bed of a great reservoir to hold back the flood waters of Mad River. Much of it is low and swampy, either on a level with or slightly above the normal level of the stream flow. Any considerable rainfall floods a great portion of it and a rain of 36 hours last March caused an overflow of nearly 2 feet above the floors of the hangars, thus seriously threatening the planes with damage and suspending training completely. A drainage system, since installed, is said to have improved this condition, but your committee is informed that the Signal Corps was advised by competent authority against locating a field upon these premises because of its low and marshy character, and the judgment of the officers and fliers at the field and familiar with the ground was a unit against its adaptability. An excellent stretch of ground within 4 miles of this field, traversed by railway and high above the river level, admirably drained by nature, was available to the board when Wilbur Wright Field was selected.

The large sums expended upon the Dayton-Wright Field, amounting to $2,878,699, and requiring an ultimate total of $3,097,777 and its use for testing purposes, probably demands its present retention if the drainage system referred to shall prove fairly effective. But, when the dam is completed—the reservoir is to be filled—the buildings must be removed or they will be submerged.

More recently the board, desiring an additional field near Dayton, was offered an acreage adjoining the Dayton-Wright Airplane Factory on the east. Inasmuch, however, as insistence was made that the lease be executed to the Dayton-Wright Co., as lessee for the use of the board, the rental to be made an item in the cost of airplane production, the representatives of the board very properly declined the suggestion, and the project is still incomplete. We feel obliged to note in this connection that shortly before negotiations for the McCook and the new field, Col. E. A. Deeds, a member of the Aircraft Board, was the owner of the first and a part owner in the second. He sold and transferred them to interests with which he had been identified and which now own them.

Contracts for Plants, Motors, and Accessories

At the outbreak of the war but few concerns were engaged in airplane and motor construction; but there were concerns devoted to other pursuits and potentially capable of producing both in quantity if encouraged to do so. The need for planes in volume, and as rapidly as possible, prompted Congress to make the largest single appropriation for the Signal Corps which, up to that time, had ever been made. Since then our engine-producing capacity has been fairly enlisted, while that of plane production has not been properly encouraged. A number of plane manufacturers, like the Wittemann-Lewis Co., of New Jersey, and in the business years prior to the outbreak of the war, have been unable to obtain contracts; while a number of concerns like the Dayton-Wright Co. and the Standard Co. have been practically organized since the war, and the former was given enormous contracts before its factories were completed.

Companies assured of capital and factory space have been denied contracts because they were not going concerns, while other companies in similar condition have received contracts, notwithstanding their present lack of producing equipment. No one official controlled or supervised the making of agreements or their execution. Beginning and ending with the Aircraft Board, the head of production, the director of supplies, the head of the contract section, and perhaps other links made up the chain of procedure. Adopting models of proved efficiency and then putting all responsible producers at work upon them would, in the opinion of your committee, have greatly expedited, as it would have guaranteed, the performance of the aircraft program.

To aid in the construction of the Dayton-Wright plant and the Elmwood plant of the Curtiss Co., the board made generous advances of money, and to them was given the task of making and supplying other contractors with plans, designs, blue prints, and specifications for the accepted types of machines, exclusive of bombing planes. This gave these concerns great advantage over their competitors, which thus became dependent upon them for material without which the work of production could not begin, and when begun was subject to suspension and delay with changes in construction and design. Moreover, the Curtiss Co. exacted a fee for copies of plans, etc of 1 per cent upon the contract price from other contractors, which, although added to the cost of production, was paid to the Curtiss Co., adding a considerable aggregate sum to its revenues.

The number and amount of contracts for planes and motors assigned to concerns at Dayton and Detroit and the number and character of aviation fields at Dayton and could not fail to attract the attention of your committee. Due to her vast automobile industry, Detroit doubtless possessed greater facilities for gas-engine production than any other American community, and the Fisher-Body Co. was well equipped for the manufacture of planes in quantity. A generous recognition of these facts was therefore inevitable.

But Dayton possessed no such advantages. Her manufacturing interests were for the most part in other directions. Industrially considered, the concentration of the greater part of the new pursuits in these two cities may perhaps be justified, but the committee is forced to the conclusion that the personnel of the Aviation Board, from its formation to its reconstruction, explains the fact.

The civilian personnel of the board and their more prominent subordinates were composed of gentlemen a very considerable number of whom lived in these cities and before or at the time of entering the Government service were leaders in and identified with the industrial development of their respective communities. The divestiture of their interests by transfer to others was a laudable though essential step toward qualifying them to public service, but the granting of major contracts to old associates, the transfer of the experimental station from Langley to Dayton, and installing it upon an inadequate tract, quite recently the property of a member of the board, the tender and qualified acceptance of a second field, formerly owned in part by the same member, the selection of the Wilbur Wright Field, physically and geographically unsuited for the purpose, and the giving of huge contracts for airplanes to a corporation created since the war began, of which he was one of the first offiers, and owned exclusively by his former partners and business associates, have provoked, and we think justly, much of the public comment which made the investigation imperative and much of the resentment of less-favored manufacturers in other localities. It is also a distinct argument for those who assume to fear and who assert that aviation, through the board, is to be made the subject of ultimate automobile control. This feature of the subject is, as heretofore stated, under full investigation by the Department of Justice.

Cross-License Requirement

Although this subject has been referred to a special subcommittee for investigation, it has constantly obtruded itself upon our attention, hence we can not avoid referring to it.

The National Advisory Committee of Aeronautics, confronted with the necessity of satisfying the claims of patentees and avoiding possible delays threatened by conflicting patent rights, determined upon mature consideration to settle these difficulties through the agency of a Manufacturers' Aircraft Corporation, to be composed of those engaged in the industry and empowered to license all aircraft contractors, who should pay a royalty to the company upon all planes and parts to be constructed and to assign to the company for the common use all patents or applications therefor owned or controlled by the licensees. The bulk of these royalties was to be paid to the Curtiss and the Wright-Martin Cos. as compensation for the use of certain patents until each had received $2,000,000. These were to be charged against cost of production and paid by the Government. The agreement was sanctioned by the Department of Justice and approved by the Secretaries of War and the Navy.

The committee has not heard a word in approval of it. It is condemned by every airplane manufacturer outside of the immediate beneficiaries. Those executing the license agreements have done so under protest because the Aircraft Board recommended or required it.

While the invincible ranks of our fighting men move steadily forward, thousands of men and women in Standard Aircraft's factories are striving night and day to speed them "Onward to Victory".

Member Manufacturers' Aircraft Association, Inc.

Thomas

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Contractors to U.S. Government

Criticisms of it are numerous, the most serious of them being that it subjects manufacturers to onerous requirements by its beneficiaries, such as assessments for the use of plans and specifications, the purchase of the material and accessories from favored houses, the assignment and surrender of valuable patents and patentable devices to the Aircraft Association upon terms prescribed by itself, the discouragement of invention, and the inevitable control of the aircraft industry by that association or by some other interest through its agency. Your committee sympathizes with many of these sentiments, and notwithstanding the Aircraft Production Board as now officered no longer requires or recommends the execution of the agreements by contractors, we believe the arrangement should be abrogated. We regard it as vicious and as designed to reap large profits by taking advantage of the necessities of the Government. The basic patentees should, of course, if the patents are valid, be compensated, but this should be done by the Government directly whenever the courts finally determine who the owners are and the patents should then be made free to all manufacturers.

New patents of meritorious character should be similarly acquired by the Government as they appear. Such a course would stimulate invention and promote the development of an art which is still in its cradle.

This is not a new departure but rather a reversion to an earlier policy, for Congress in 1917 appropriated $1,000,000 for the purchase of aircraft patents, which sum is still available, and if insufficient for the purpose it can be easily increased. The Government should never be made the victim of a patent monopoly which it generously created for the sole protection of the inventor against infringment by persons and corporations.

Difficulties of Aircraft Production

Much can be said in extenuation of the disappointments encountered in aircraft production. The industry is new and highly technical. Mechanics skilled in the art were few when the war began, and of aviation engineers there were scarcely any. Production capacity was undeveloped, and even planes for training were not immediately obtainable. Up to January, 1917, only 118 aeroplanes of all types had been delivered to the Army, 64 of which were made in 1916, and there was no aircraft organization either in the Signal Corps or out of it. The Bolling Commission was not sent to Europe until June, and its report was not received until September. But for the glowing forecast and optimistic announcements which the board and others made to the public from time to time regarding its actual and prospective performance, and the certainty of speedy and unlimited production, public disappointment would not have been so pronounced nor public resentment so widespread. Great Britain in 1915 and 1916 experienced delays, miscarriages, and expenditures. Instead of profiting by her experiences the board incurred similar ones and accentuated them by representations and assurances which were not warranted by the actual facts.

The order of the President creating a Military Bureau of Aeronautics and a Director of Aircraft Production and the appointment of Gen. Kenly and Mr. Ryan as the heads of the two divisions is an improvement upon the previous situation, and a number of the conditions we have criticized have been or are in the process of being corrected and better methods instituted. For example, a single board of engineers formed by combining the technical and production engineering sections and headed by a chief selected by Mr. Ryan, with the approval of Gen. Kenly, has been established; one testing board under the command of a single officer has succeeded the double system formerly doing the work. The Military Bureau, under agreement with the director, after thorough experiment by actual fliers and aeronautic engineers, now determines the character of machine to be produced, and the business of the director is to produce it.

Recommendations

1. The inspection of the finished product and other material is now the work of Gen. Kenly's division and is to be done by thoroughly competent officers. Work not satisfactory to Gen. Kenly or not up to the requirements of his Bureau is rejected. Cooperation for the common end has been, and we hope will be, observed by the heads of the two divisions and required from their subordinates. The loose ends of the former organization have been gathered up as rapidly as possible, and the results of the improved conditions are already apparent in some directions. But the system is still subject to the criticism that it is dual in character, which is unsatisfactory, since it may at any time lead to differences and to division of responsibility. We are constrained, therefore, to renew the committee's recommendation of last April, sustained by the opinion of every man whose views were consulted by us, that the whole subject should be under the control of one man. Our present organization is faulty because divided into two parts with a man of strong will and opinion at the head of each division. While these two divisions are correlated, they may not be permanently coordinated. Your committee therefore believes that the importance and magnitude of aviation as a permanent branch of our military organization requires one directing and responsible head both for its efficiency and speedy development. Its classification with the Army and Navy as a distinct arm of the service is essential to this end.

Of comparative insignificance at the outbreak of hostilities in 1914, aviation has become indispensable in modern warfare. Without aircraft no army can any longer hope to triumph or, indeed, to escape inevitable defeat. Without aircraft the most powerful navy must in these days remain upon the defensive. The aircraft force of Great Britain and France each outnumber the Regular Army of the United States when we declared war, and ours should soon be as large as theirs. It is a distinct arm of the service. Great Britain and France, recognizing its supreme importance and the need of its swift expansion, last year each converted it into a department of its own, whose head, as minister of the air, ranks as an officer of the cabinet, who is held responsible for efficiency of production and manufacture and an efficient force of aerial fighters. We should do likewise—create a department of aviation, under the control and supervision of a secretary, and ranking with those of the Army and the Navy. We would thus place power and responsibility in the hands of single man, organize a service not alone for this war but for all time, and establish for the forces of the air the same policy of administration that has so long governed those of the land and of the seas.

The cost of equipment and maintenance is rapidly approaching that of the Navy, while training for aviation is as distinct and as technical as that for West Point and Annapolis.

The creation of the department of the air would unify the service, thus removing all friction between the Army and the Navy divisions of the service by subjecting both to the control of a common head. Differences between them under present conditions are unavoidable, and, while more disagreeable than serious so far, they will arise from time to time, tending to seriously disturb the service, besides interfering with production.

2. A commission of engineers and pilots for observation at the front, formed in relays and reporting in person to the department at frequent intervals, is also imperatively demanded. The betterment of the air service through the exigencies of actual warfare is rapid and important. They should be accurately promptly reported in detail to the home office, and this can be efficiently done in no other manner. Similar conditions have long been maintained by our allies, whose policy in this regard we will do well to adopt.

3. But your committee feels that the prime need of the hour is machines in continuing quantity, and the production of them should be accelerated by enlisting the constructive activities of all responsible concerns engaged or which can be engaged in the business to full capacity. We can not, while the war lasts, have too many effective planes. Supremacy of the air means a speedy triumph. We have hundreds of trained pilots waiting for planes, whose services must be postponed for their production.

Planes to be useful must have motors. These, too, should be in production in every factory that can and will turn them out, due allowance being, of course, made for other equally insistent requirements for ordnance, ships, and the like. If this is done, the results for 1919 will then compensate somewhat for the disappointments of the current year.

4. The rapid development during the war of the aeroplane and its effective use as an important arm of the military, makes it imperative that America give greater attention to the perfection and production of aircraft. This should be done not only as a war measure but as a commercial and industrial necessity.

The importance of a powerful air force and an abundance of heavy artillery can not be overstated in bringing the war to a speedy and successful conclusion. With our vast resources in raw material and our facilities for manufacture we can, by the adoption of a broad program and with the assistance of our allies, obtain the complete supremacy of the air.

Without hesitation or delay we must give attention to this expansion of our aircraft policy. The inventive and productive genius and energy of America must be devoted to the creation and improvement of new types of aircraft and engines. Our present program must be greatly enlarged. The United States should establish at Government expense college and university courses in aero dynamics and mechanical engineering, in addition to courses for training flyers.

While quantity production is essential to the complete equipment of our armed forces, quality should not be sacrificed to quantity. The aeroplane requires the highest degree of skill in workmanship and the very best kind of materials.

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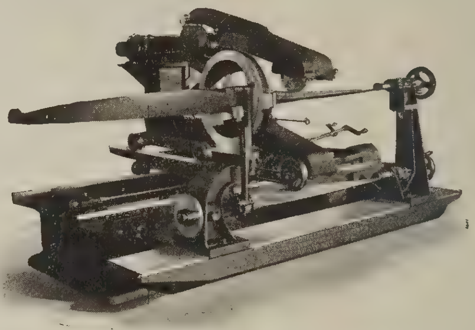

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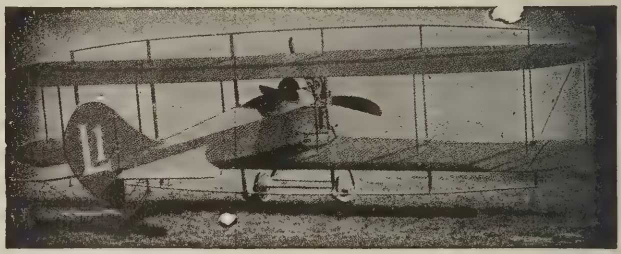

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The aeroplane is a product of American genius, but the credit for its development largely belongs to other nations. America should meet this challenge by bringing the aeroplane to still greater perfection.

5. The inventive genius of the Nation should be encouraged in the most effective way. A Bureau of Inventions, recently established by the War Department, is a step in the right direction. A persistent complaint, doubtless in a large degree due to the disappointment of men whose devices have not been pronounced practicable, is that under the administration of the old board scant consideration has been given to new devices and suggestions. This seems principally to have resulted from the absence of any well-defined individual agency having full authority to deal with the subject. One man, the designer of a model for a dirigible with a car integral with the Blimp, began with the Advisory Committee and was passed on from one officer to another until he finally completed the circle and was referred back to the committee which started him on his journey. About six months were consumed in making the circuit and nothing was accomplished. A plane designer encountered a similar experience, with the added one that his plane was crushed to pieces in a sand test which was declared satisfactory by those who made it but wholly unsatisfactory by those empowered to make final decisions. Many, perhaps most, of the so-called inventions brought to the notice of the authorities in times like this are of no importance. But if the germ of something new and useful can be detected in one of a multitude of models, the time and energy expended in discovering it will redound to the benefit of the Nation.

6. Ample protection should be extended by the Patent Office to applicants for patents for inventions relating to the public welfare and defense. This is demanded not so much for the inventor as for the Nation. Authority for this now exists, but it seems to be exercised at times and disregarded at others. Additional legislation may be necessary to make this precaution effective, but in the meantime a suggestion from the Production Board to the Commissioner of Patents regarding applications for inventions relating to aircraft would doubtless shield the application from all publicity, thus assuring its indemnity against disclosure to enemy interests.

7. The margin of profit on some contracts particularly for motor production, is altogether too high. According to the estimates of the accounting division they appear to be for the Liberty motor at one of the plants, 33.6 per cent; for Liberty engine aluminum pistons, 285 per cent on capital invested; for the Le Rhone, 92.8 per cent on cost of production; and on the D. H. 4 plane about 50 per cent. This is largely due to the primary unfamiliarity of officials with the cost of rapid manufacture of novel products in great and urgent demand.

The hight cost to the Government having been now demonstrated we feel sure that future contracts will result in great saving to the Government.

8. Planes and engines rejected because of defective construction or materials not furnished by the Government direct should be at the cost of the producer. Existing agreements require payment from the Government for everything delivered, presumably because they have passed official inspection. But when producers are required under their agreements to bear the expense of an inferior product, on the perfection of which human life is absolutely dependent, their own inspection will be of the best and good workmanship will inevitably result.

9. Your committee in inspecting the aircraft plants have noticed the great danger of destruction by fire, owing to the hazardous processes of manufacture, hasty construction, lack of automatic sprinkler and other fire protection.

The burning of any of these factories, in whole or in part, at this time would be a catastrophe, for it would greatly cripple the aircraft program.

We urgently recommend that the requirements of the Fire Prevention Bureau of the National Council of Defense, composed of fire-insurance experts, for better fire protection in these factories be made immediately compulsory by the Director of Aircraft Production, and that a stipulation be inserted in future contracts compelling a compliance with such recommendations.

(*Continued from page* 1225)

Smith, Barrett Putnam	FLA; DAP
Spriegel, William Robert	SLA; KST
Scobey, Reuben Bert	SLA; KST
Shropshire, Noble Samuel	SLA; CRI
Skagerberg, Rutcher	GLC
Smith, Stanley	GLC
Smith, Edson B	UTA
Schoomaker, Earle W	WFO
Seawell, John L	WFO
Stevenson, Norman M	WFO
Squires, Cameron	CPA
Stevenson, Raymond V	FRF
Smith, Clarence Alfred	TFT
Sibbald, Bruce F	FRF
Snyder, Joseph C	SMM
Smith, Howard E	GLC
Sohn, Elmer L	PWM
Spicer, Orville E	PWM

T

Taylor, Elmer L	LHV
Turner, Luther Martin	SLA; CLC
Thien, Edmund J	KST
Teborck, Joseph Edgar	SLA; KST
Taylor, Alfred B	WFO
Taylor, Russell L	WFO
Teeter, Charles	WFO
Thompson, William W	WFO
Thornburg, David W	WFO
Trider, George H., Jr	WFO
Trueheart, James O	WFO
Truscott, E. Arthur S	WFO
Taylor, Leonard D	BST
Tillinghast, Harold A	FRF; BST
Tussing, Earl B	EOT
Thomas, Harvey L	FRF
Turner, Lawrence Milford	SLA; CGC
Tupper, Preston E	FRF
Thompson, Richard E	FRF
Taylor, Everett E	Note: 13
Thompson, Charles Dunning	SLA; DAP
Trefz, Walter	SLA; EOT
Trotter, Joseph T	FLA
Turner, Wright E	FRF
Taylor, Clarence Minor	SLA; LDT
Tissot, Thomas P	FRF

V

Van Duke, John M	RSD
Von Hake, Richard Arnold	SLA; KST
Van Vliet, Fred Shiras	SLR; FRF; LDT
Van Bergen, Kenneth B	FRF
Vincent, Osmer Herbert	LDT
Vines, John O	DIK
Vyse, William Clark	SLA; FLA

W

Watson, William Fred, Jr	SLA; CGC
Walker, Harry Warren	SLA; KST
Wackenhuth, Charles R., Jr	TFT
Whittemore, Chester Leslie	SLA; CGC
Watson, Edward B	DIK
Wikle, James R	PFO
Williams, James	LHV
Watson, Frederic Froome Talfourd	SLA; RSD
Wurster, William Frederick	SLA; GLC
Weissman, Arnold Eugene	SLA; RSD
Warren, Francis E	WFO
Wiliams, Richard E	WFO
Whiteside, Rush S	WFO
Wilkinson, James L	WFO
Wright, John R	WFO
Wooddhull, Frost	SLA; KST
Wheeler, Howard True	SLA; EOT
Woolsey, Clinton F	DIK
Walthall, Leroy A	BST
Weaver, Van John	BST
Westall, William H	BST
Windsor, Thomas H	BST
Wolfe, Kenneth B	BST
Weaver, Charles J	FRF
Whittemore, Hollis L	BFT
Williams, Errett	AAD
Wade, Don D	DIK
Windsor, Thomas Henry	LDT
Wales, Edward V	DMA
Walzer, William	SLA; DAP
White, Frank Edward	SLA; LDT
Weitekampe, Elmer J	HHN
Waite, John D., Jr	FRF
Wiley, Dana	SLA; RSD
Warren, Francis E	FRF
Whitten, Lacey R	FRF
Wirz, Walter	FRF
Worrall, Anton Wallingford	SLA; CGC
Watson, John Alfred	SLA; CGC
Williams, John William, Jr	SLA; CGC
Wurster, William F	FRF
Walker, Waldo C	FRF
Wagner, Hilton J	RWT
Weir, Matthew Stanley	SLA; EOT
Weaver, Joseph W	SLA; VDW
Wolff, Herman D	FRF
Wood, Robert V	FRF
White, Edward Oliver	SLA; LDT
Wilson, Thomas	SLA; VBW
Westerlind, Carl J	Note: 13
Wing, Charles R	WFO
Wachtell, Morris E	WFO
Woolsey, Clinton F	WFO
White, Charles W	Note: 4
Wirz, Walter	SLA; BET
Witten, Lawrence C	SMM
Wakefield, Marc Everett	SLA; EOT
Ward, Charles Henry	SLA; MAC
Williams, Richard Gordon	SLA; CRI
Wright, Clifford Anderson	SLA; HHN
Wiswall, George H	PWM
Waterman, Herbert W	FRF
Wootten, Richard Kelly	PFO
Waters, Leland L	FRF
Wilkins, Charles H	WFO

Y

Yost, Paul K	DMA
Young, Carlton Edmonds	SLA; WFO
Young, Clifford M	SLA; TFT
Young, Victor M	WFO
Younger, John E	FRF
York, Duke A	PFO
Yerby, Walter T	SMM

Z

Zimmer, Harry Michael	SLA; KST
Zipf, Oscar Robert	SLA; KST
Zimmerman, James L	WFO

Radio Schools Established at Two Artillery Camps

The War Department authorizes the following:

Training schools for radio work have been established by the division of military aeronautics at West Point, Ky., and Camp McClellan, Ala., Field Artillery firing centers, and instruction work along these lines will eventually be extended to Fort Sill, Okla., and Camp Jackson, S. C., and also to Field Artillery firing centers where observation schools of the division of military aeronautics are now working in co-operation with the Artillery branch of the service.

These are only a few of the first steps in coordination that are now being instituted by the different branches of the service in the camps of this country. Heretofore advance schooling was to be obtained only when the American troops reached France.

Instruction in radio covers wireless communication between the flyers in the air and gun crews on the ground below. By means of radio the flyers are able to signal for barrages, the location of batteries, ammunition dumps, infantry, trains, and other targets, and also to "spot" for its own particular battery, which means to tell that battery whether its shells are landing to the right or left, over or under the target at which it is firing.

Fonck Downs Three in Twenty Seconds

Paris.—Lieut. Rene Fonck, the famous French aviator who shot down three German aeroplanes on August 14, accounted for all three of them in the record-breaking time of twenty seconds.

Fonck went out escorted by two patrolling machines. After cruising for ten minutes he spied four enemy two-seater battleplanes flying in Indian file, a few hundred yards between each. He fired on the first with his machine gun and it fell in flames in ten seconds. Then he got his sights on the second machine with the same result. The third dodged sideways before Fonck could take aim and escaped, but by a swift turn he dashed at the fourth plane and sent it down to join the other two.

Recognized as the greatest French air fighter since Capt. Guynemer, Lieut. Fonck is credited with bringing down sixty enemy aeroplanes—six of them in one day in the course of two patrols. He is twenty-three years old and has been in the aerial service a little over a year.

American Naval Flyer 30 Hours in Dirigible

London.—Ensign P. J. Barnes of the United States Navy now holds the record of patrolling for thirty hours in a certain type of dirigible off the English coast. This beats the previous flight record held by him of twenty-five hours and forty-two seconds.

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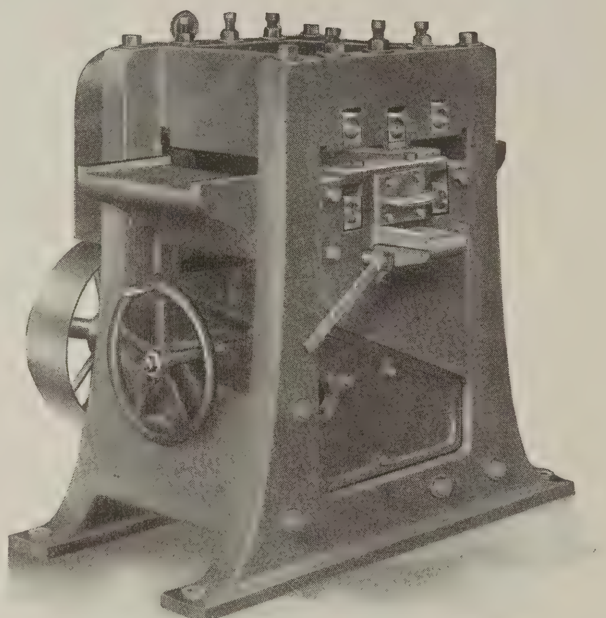

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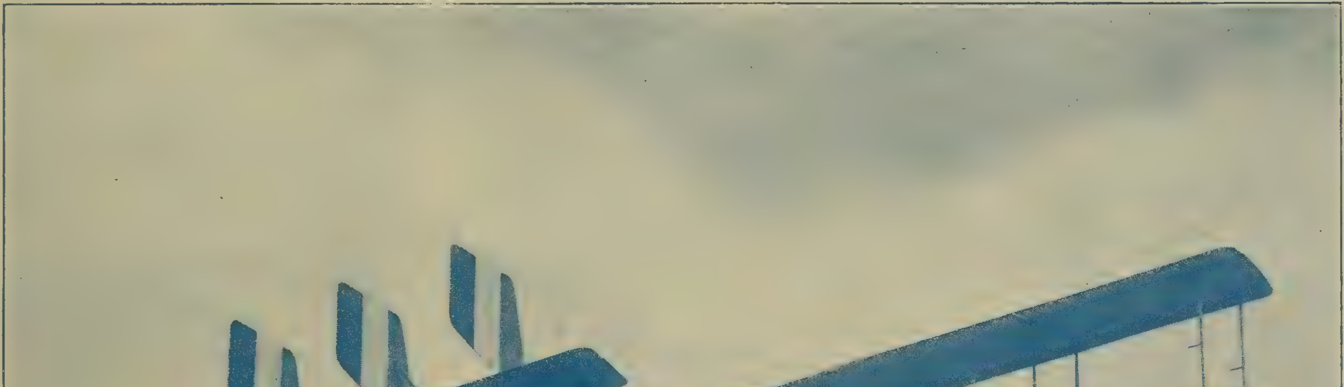

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AERIAL MAIL FOR CHICAGO AND CLEVELAND

BY the time AERIAL AGE leaves the presses the first trip of the New York—Cleveland—Chicago Aerial Mail line advocated by the Aero Club of America, the Aerial League of America and AERIAL AGE since last May, will have taken place.

As this is being written the mailing department of AERIAL AGE is working overtime preparing thousands of letters to be sent on this first trip to our advertisers and to other prominent people in the aeronautic movement.

This first trip, which is the initial step towards establishing a permanent aerial mail route, will take place Thursday, September 5, "rain or shine," as Postmaster Praeger and Captain Lipsner, the two able and energetic postal authorities put it.

Two planes—a Curtiss and a Standard—will be sent over the course from New York. The return trip from Chicago is planned for Saturday and mail will be carried each way.

In announcing the flights the Post Office Department said the purpose was to chart the course for distinguished landmarks and safe landing places. The course has been named the Woodrow Wilson Airway, plans of which were published in a recent number of AERIAL AGE, and plans to have regular stops at Lock Haven, Penn., Cleveland, and Bryan, Ohio. With favorable weather conditions the flight should be completed in less than ten hours.

On the initial trip Thursday the planes are due at Lock Haven at 8:30 A. M.; Cleveland, noon; Bryan, 1:30 P. M., and Chicago, 4 o'clock. On the return trip the machines will leave Chicago at 6 A. M.

Aviator Edward V. Gardner will pilot the Curtiss plane and Aviator Max Miller the Standard machine. The distance to be traveled is 745 miles. The starting and landing fields will be Belmont Park, New York, and Grant Park, Chicago.

Another Record Established by the Aerial Mail Service

Belmont Park, L. I., Sept. 2.—The air mail service between New York and Washington today was not only in operation, but the flyers broke records in celebration of the holiday and made through trips both ways between the terminals. Maurice Newton left Belmont Park with the mail going south at 11:56 A. M. and reached Philadelphia at 12:49 P. M., 53 minutes. Taking on the Philadelphia mail, he got under way again at 1:03 and reached Washington at 2:44, or 1 hour, 41 minutes, making 2 hours and 34 minutes lapsed time for the through trip.

In the other direction, C. DeHart left Washington this morning at 11:37 and reached Philadelphia at 1:23 P. M., or 1 hour, 46 minutes, and, starting again at 1:38, reached Bel-

(*Continued on page* 1286)

MR. JOHN D. RYAN EXPLAINS PROGRESS OF AIR PROGRAM

DISCLOSURES regarding some of the more recent aspects of the aviation program were authorized by John D. Ryan, on the eve of the relinquishment of his post as Director of the Bureau of Aircraft Production to become Second Assistant Secretary of War and Director of the Air Service.

Mr. Ryan revealed that the orders for 12-cylinder Liberty motors had been more than doubled and that new types of aeroplanes were being experimentally developed in an effort to find a plane that would prove a success when equipped with the Liberty motor.

In the effort to develop these new types of machines that would be satisfactory to the army, Mr. Ryan said the services of Orville Wright were being utilized. Mr. Wright is a member of the Dayton-Wright Company which is making a large number of planes for the Government.

At least four machines that are new in American aircraft manufacture have been tested at Dayton in the last two weeks, Mr. Ryan said, one of them being the S. E-5, a British machine, and another, a copy of the English Bristol, is being experimentally flown with an engine of the same power as is used in this machine in the British Army. Two foreign officers have designed machines which are being tested. One was designed by Captain Lepere, a French officer, and has been flying, experimentally, for thirty days.

Mr. Ryan said that during the past week Pomillo Brothers had come to this country to design planes to fit our engines and have established themselves at Indianapolis. At least two other types were being flown experimentally, Mr. Ryan said, but he did not consider it wise to go into details regarding them at this time. Mr. Ryan refrained from discussing the Senate report on its aircraft investigation. He preferred to deal with the present and future instead of with past mistakes.

"I am not going to discuss reports of investigations," said Mr. Ryan. "We think that satisfactory progress has been made in many respects. We were unfortunate in having to abandon the production of one of the smaller types of aeroplanes, the so-called Bristol fighter, which was proved after thorough tests that it was not a safe machine, that it was not a useful machine for military purposes, and we are not going to make it or any but safe machines and machines of military value. We may repeat that kind of a mistake; we may find that we are even ready to go into production with a machine and we may have spent a lot of time and a lot of effort in developing it, but when we get to the point, whenever and wherever it is, where we find a machine is not of military value, we are not going to produce it."

While the Bristol fighter has been abandoned those responsible for the aircraft production program are continuing the manufacture of De Haviland-4s, but trying to improve them and meet the criticisms that were made by General Pershing in his cablegram of June 24 last.

"We are making a good many De Haviland-4s," said Mr. Ryan. "There has been a good deal of criticism of them and there have been a good many changes made on them recently. These changes have not been discovered in the way that is generally supposed. I mean the so-called defects that result in changes are not in many cases what you can really call defects at all, but improvements in workmanship, and they are going all the time. Men are learning to do these things better all the time. Improvements may be developed in one country or another on different kinds of planes but as they are developed they are incorporated in every machine that can carry them.

"The De Havilands are being built now in about the same quantity as before the change was made. It is not a totally different machine, it is just an improved machine, and we think in a few months it will be improved further.

"On account of the cancellation of the Bristol because it was an unsafe machine, it left us for the time being a limited program as far as manufacturing was concerned, because we were developing other types that had not been brought to the point of production."

It was at this point that Mr. Ryan spoke of the experimentation now in progress in an effort to find types of planes that might be placed in quantity production, if found successful.

"In the last two weeks," Mr. Ryan said, "as a result of these months of investigation and study and design, we have flown in tests at Dayton at least four machines that are new as far as our manufacture is concerned in this country.

"We have flown the S. E-5, which is a British machine, a single-seated fighter. Samples of it have been brought over from England, copies have been made in this country, and with our engines in them they have been flown and are now being tested. In a few days we will decide whether that machine will go into quantity production or not.

"The exact copy of the English Bristol with an engine of about the same power that they use in it in England has been brought over here, copies have been made, machines have been built, and they are being flown.

"Another machine now being tested was designed in Detroit by Captain Lepere, a French officer, who was brought over here to design machines equipped with Liberty engines. Three different machines of that type have been flown and are very promising.

"There are at least two other types of machine that are being flown that we do not think it advisable to give publicity to because they are not so far along that we feel satisfied that they are going through. We do not want to say that we have five types and come out with only three. These are all machines that can be made in quantity, and, of course, it will take some little time to get them into production, but the work of design has been going on. Now we are using, contrary to the general supposition, many American designers of reputation.

"Within a week the Pomilio Brothers, an Italian family of aeroplane designers, have come to this country. They have a number of very effective types of machines in use in the Italian Army. They were very successful designers and builders of aeroplanes in Italy, but they sold their business to the Anseldos the big munitions people of Italy, and they have come over here. They have come to the United States to design planes to fit our engines and are established in Indianapolis and are at work. They brought about thirty designers and workmen with them.

"This is just to give you a general idea of the scope of preparation that is being made to put us in production on planes that will fit our engines. The types of planes that we are building are fixed by the engines that we are going to build, for, after all, engines are the limiting factor.

"We have increased the orders for Liberty motors from 22,500, when this bureau was formed, to approximately 50,000—that is the Liberty '12.' We have ordered a large number of Liberty '8s' which were developed and set aside temporarily for the '12s' when the larger and more powerful engine was decided upon. We have contracted for some of the very best foreign engines, such as the Hispano-Suiza motor. We are going into quite a large production at some of the best engine building shops in America with that engine. Our engine program is a large one. We are giving every inducement to engine builders who are at work on these things, and they have to be selected carefully because it is not every engine builder, no matter how successful he has been, who can build a high-powered aeronautical engine.

"We are not afraid of what we can accomplish, but we are not going to make any promises or predictions."

When Mr. Ryan was asked whether the eight-cylinder motor had been perfected he replied: "There are a number of Liberty 8s in production."

It was suggested to Mr. Ryan that the Allies had not enough planes on the front, and he was asked whether our production was doing anything to meet that need.

"I would not say," replied Mr. Ryan, "that we are meeting the need on the front because that need there has never been met, not only as far as American Army is concerned, but it has never been met as far as any army is concerned."

"Are aeroplanes going across in large quantities?" he was asked.

"Planes," replied Mr. Ryan, "are going across in fair quantities now; not in many types, but we are supplying engines for planes that are being built in both England and France, and in that way obtaining just that many planes for our own army and in considerable numbers.

"Every one of our allies is calling for Liberty engines, and demanding them, finding it impossible to meet their own production of planes with engines for them. They are all relying on our production of Liberty engines; not for a few engines, but for a large part of their program."

AMERICAN AVIATORS MAKE 964 FLIGHTS IN TWO WEEKS

Reports Show Ninety-four Combats, With Twenty Enemy Flyers Downed and Sixteen Tons of Bombs Dropped on Conflans, Longuyon and Damourie in Daylight—French Airmen Active—

Washington.—American aeroplanes in France, official despatches report, made 964 flights during the first two weeks of August, engaged in ninety-four combats and brought down at least twenty hostile flyers, one captive balloon and probably two other enemy aeroplanes not officially accounted for. The American bombing planes attacked in Conflans, Longuyon and Damourie in daylight, dropping nearly six tons of projectiles. The record of an American air unit consisting of seventy-five pilots shows that during July it shot down twenty-eight enemy aeroplanes and one balloon. Eighteen other planes are said to have been brought down, but this is not confirmed. The American airmen engaged in 144 combats and went on 131 combat patrols.

The unit's best days were July 16, when six enemy machines and one balloon were destroyed, and July 24, when five aeroplanes were destroyed without an American casualty.

On the front east of St. Mihiel an enemy aeroplane was shot down Tuesday after it had attacked several American observation balloons.

OUR ALLIES EXCEEDINGLY OPTIMISTIC ABOUT AMERICAN AERIAL CO-OPERATION—GREAT PRAISE FOR LIBERTY MOTOR'S WORK ON WESTERN FRONT

By G. DOUGLAS WARDROP

AFTER a sojourn in Europe of some five weeks, during which I interviewed the Allied engineering, trade, and official aeronautical authorities, I return to America with the most cordial message of appreciation of what America is doing for the quickening of the realization of a dominant Allied aerial supremacy. On all sides the Liberty motor is hailed as a huge success, and the most vociferous opponents of a standardized aero engine now admit that America is destined to lead the world in the rapid production of high-powered engines.

Lord Weir, the Air Minister, was most enthusiastic, and desired Aerial Age to convey to the American industry not only his congratulations at the progress already made, but his confidence that the plans to which America was now committed would give the balance of air power to the Allies necessary to secure complete success.

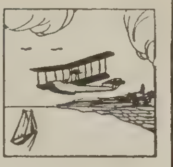
The American airmen at the front and those attached to the various areas of the Royal Air Force, are giving a remarkably good account of themselves, and it would surprise our readers if we were able to tell just what proportion of the personnel of the combined Allied air services are American and Canadian. Most decidedly is the North American contingent doing its share in the air war in France.

The establishment of the Independent Air Force in England has eliminated what had hitherto been a very weak link in British air service. This arm, the sole duty of which is bombing, and particularly night bombing, is demonstrating its worth daily, and when it is fully augmented by the units from the American air service, it will be indeed a formidable power.

Throughout the entire Air Ministry in Britain, and the

(*Continued on page* 1281)

THE NEWS OF THE WEEK



Mass for Lieut. Thaw

A requiem mass was celebrated on September 1 in the Protestant Episcopal Church of St. Mary the Virgin, in West Forty-sixth Street, for Lieutenant Blair Thaw, of the American Air Service, who was killed on the American front in France when his aeroplane met with an accident. The celebrant was the Rev. Henry S. Whitehead, who was assisted by Stephen B. Thaw, the lieutenant's older brother, a candidate for holy orders. A number of French and American officers attended the services.

Those present at the mass included Mr. and Mrs. Stephen Thaw and other members of the Thaw family, Major Baroetta, in charge of the French Aviation Mission to the United States; Major J. S. Phipps, representing the Department of Military Aeronautics, U. S. Army; Messrs. Alan R. Hawley and and Henry Woodhouse, representing the Aero Club of America; Captain Benj. B. Lipsner, the superintendent of the Aerial Mail Service; Miss Lillie Lawlor, Mr. G. Douglas Wardrop, managing editor of AERIAL AGE; Mr. Leroy B. Gulotta, managing editor of *Air Power;* Mr. Evan J. David, business manager of *Flying,* and other United States, French, British and Italian officers and authorities.

Blair Thaw was the younger brother of Major William Thaw, of the American Air Service in France, who became distinguished as an aviator in the French Army before the United States entered the war. He was a son of Mr. and Mrs. Benjamin Thaw, of Pittsburgh, and 640 Park Avenue, this city. The young aviator obtained a civilian pilot's license and had invented an aeroplane stabilizer nearly three years before he joined the American Air Service last December, at the age of 18.

In his tribute to the memory of Blair Thaw, Dr. Whitehead reviewed the aviator's brief but eventful life.

"Those who knew and loved him most intimately," he said, "remember the sunny child, gentle in manner, fearless, generous, loving dumb animals, and chivalrous to the weak. They remember the boy who excelled in all the tests of manly skill, and whose chief interests from the very earliest times of self-expression centered in the intricacies of mechanical construction, an absorbing interest which was not tardy in developing into genius."

Order Amends Wording in Aero Classification

Schedule B of classified positions which may be filled upon noncompetitive examination is hereby amended by inserting in Subdivision IV, War Department, paragraph 1, after the words "aeronautcal mechanical engineers" the words "aeronautical chemists." As amended the paragraph will read:

"1. Aeronautical engineers, aeronautical mechanical engineers, aeronautical chemists, instructors in flying, student instructors in flying, aviation mechanicians, inspectors of aeroplanes and aeroplane engines, and aeronautical mechanical draftsmen in the aviation section of the Signal Corps."

WOODROW WILSON.

THE WHITE HOUSE.

Air Targets at Hempstead

A target ground for bombing practice by air pilots will be made ready soon on low lying meadows at Great South Bay, L. I., it is expected, as a result of negotiations that were begun by War Department representatives with the Town Board of Hempstead. The plan is to contract for 6,000 acres of property.

The aviators will be trained to do effective shooting at land targets with machine guns and to drop bombs from the air. Similar practice probably will take place over water. It is planned also to establish a barred zone on Hempstead Bay, where targets to represent submarines will be set afloat.

Aircraft Technical Section Moving to Dayton, Ohio

The Director of the Division of Military Aeronautics announces that the technical section is moving from Washington to Dayton, Ohio. This section is headed by Lieut. Col. T. H. Bane, National Army.

The technical section passes on such designs of aircraft and accessories as are submitted to it by the Bureau of Aircraft Production and outside individuals and concerns, which might be of value in relation to military aeronautcs. Wilbur Wright Field, at Fairfield, Ohio, is used by this section to conduct special researches and experiments in the testing of planes and accessories.

The movement of the headquarters of the technical section to Dayton brings it in closer relation to the scene of its experiments.

Lieutenant Bouchon, a French observer now in this country

Two Zeppelins Lost in a Storm at Sea

London.—In a violent storm on August 23 two wrecked Zeppelins were seen from Sandefjord, Norway, according to a Copenhagen dispatch to The Exchange Telegraph Company.

The crews were aboard the Zeppelin, but had lost command of them. The airships are supposed to have come down in the North Sea.

Training of U. S. Aviators Progressing in Far West

The War Department authorizes the following:

Maj. Gen. Wm. L. Kenly, director of the Division of Military Aeronautics, who has returned from a trip to the Pacific coast, visiting the spruce and fir country with John D. Ryan, director, Bureau of Aircraft Production, and later all of the flying and balloon fields on the coast, makes the following statement:

The Division of Military Aeronautics is speeding up the training of fliers, and the schools are responding splendidly to the calls already made. It is my desire to be ready to produce whatever number of fliers are called for. Training schools are now being grouped in districts, so that the cadet fliers may pass from ground, primary, and advanced instruction all in one locality, and when the final test is passed be ready for France. It is also the intention as classes of these cadets finish their training as fliers to organize them into squadrons and brgades, so that they may be sent overseas as such and take the air at the front in the formation in which they have been trained.

Our study and observation and also the experience of officer instructors who have been overseas makes us confident that this country offers the best training grounds, not excepting England and France. This is primarily so because we have unlimited room here in the United States. We are now equipping our flying fields with experienced instructors. In England and France the population is so great and uninhabited areas are so few and far between that it is difficult to locate even half a dozen training fields, to say nothing of several dozen. Over there, for instance, it is difficult to establish a gunnery school for fear of the damage that might be done to noncombatants or even to buildings. Gunnery schools require great areas of open ground in isolated districts. It is easy to locate such fields in the United States and at the same time have them accessible.

The spirit of the West and the morale of officers and men, no matter whether they came from the North, East, South or West, is altogether splendid. They are absolutely fearless, show a high grade of intelligence, and are bound to give a good account of themselves.

One of the fields I visited was Mather Field, at Sacremento, Cal. This field has a record of 250,000 hours of flying without a fatality. Another interesting place was the balloon field at Arcadia, Cal., where I saw seven balloons in the air at one time. The site of this field is a ranch back of which mountains rise to elevations the tops of which offer the same atmospheric conditions as the cadet gets suspended high in the air in the balloon basket. By taking the cadets up in these mountain tops the instructors can train a large number at a time in observation and range-finding work instead of limiting the classes to a few pairs in balloon baskets.

We want good men in the Air Service, and we will need them in generous numbers. As soon as the new draft regulations are determined I will venture to say that there will be unlimited opportunity for young men of the right caliber in flying schools and on the ground for both this country and overseas.

Anacostia, D. C., Flying Field to be Extended and Improved

The War Department authorizes the following:

The Assistant Secretary of War has approved an allotment of $103,850 for improving and extending Bolling Field, Anacostia, D. C. This field, on the left bank of the Eastern Branch of the Potomac, is being enlarged for the aerial patrol and protection of Washington, as well as to meet the training needs of the Air Service officers in Washington.

Besides enlarging the flying field, an additional hangar will be erected and quarters for 23 officers and 154 enlisted men provided. The high-tension electrical wires at the southern end of the field and the drainage ditch, which are now dangerous to the flyers, will be removed. An aero repair shop and a machine shop will be erected and the whole field encircled by a high barbed-wire fence.

There will be a balloon station with one company located north of the flying field. The equipment will include captive balloons and free balloons for training observers.

A photo-developing hut for the developing and printing of aerial photographs taken in the vicinity, and a small radio telegraph station for the purpose of working up communication with aeroplanes while in flight will be additional features of the development of ths aero flying field adjacent to the National Capital.

Landing Fields for Airmen

The War Department has announced that fields have been established in New York, Pennsylvania, Ohio, Illinois, the District of Columbia, Texas, Georgia and California. In Arkansas, Mississippi, Alabama, New Mexico and Nebraska such landing fields will be shortly provided.

Aviation Ground Schools Dropped

Concentration of all ground schools for training Army aviators at four universities has been determined upon by the War Department. The schools at Princeton University and the Universities of California and Illinois and Texas are to be retained. Those at Cornell, the Ohio State Universities and the Massachusetts Institute of Technology will be abandoned.

Sikorsky Now With Voisin Company

Sikorsky, the pioneer Russian aeronautic inventor and designer, is now associated with the French Voisin Company, in the capacity of consulting engineer. It is understood that he has received a special commission to carry on experiments with multiple-motored bombing machines, and considering his early entry into the heavy weight-carrying field, the results of his experiments should be of interest.

Douglas Campbell, American Ace, is Expected Home Soon

San Jose, Cal.—Douglas Campbell, the American "ace," is expected in San Jose within a few days probably, according to a statement from the aviator's father, Dr. W. Campbell of Lick observatory.

Meissner of Brooklyn Downs His Sixth Foe

James Armand Meissner, of No. 45 Lenox Road, Boorklyn, has downed his sixth German aeroplane, according to a letter home.

French Ace Says He Has No Tactics

With the French Army in France.—Lieut. Rene Fonck, the leading French ace, has brought down since Jan. 1 fifty of the more than threescore German aircraft he has destroyed.

Of the fifty enemy machines vanquished this year, he has conquered thirty-two in the same Spad-Hispano biplane with two machine guns, a record for one machine.

"Tactics? I have none," he said. "I attack watching my adversary's manoeuvres. In the last combats in which I have participated I have succeeded in forcing my manoeuvring upon them. Until the end I aimed to keep the mastery of the manoeuvre.

"Generally I shoot from 150 metres, according to my relative position. If I attack frontally I start to shoot at 150 metres, that being the most suitable, allowing for the speed of the machine. If I attack in the rear or laterally, I get closer."

Larger Camp at Lee Hall for Artillery Gunners

The War Department authorizes the following:

In order that the work of training men for heavy artillery may be developed as rapidly as possible and under the most favorable conditions, it has been decided to increase the size of Camp Abraham Eustis, at Lee Hall, Va., at once. Orders have been issued to the Construction Division to proceed with the work. It is estimated that the additions will cost $1,940,800.

The enlargement calls for motor transportation schools for 500 students, garages, repair shops, a short railroad, concrete roads, new ranges, and barracks and quarters for one trench motor battalion and one anti-aircraft battalion.

Aviator Hitchcock Escapes to Switzerland; Jumps from Train, Walks 80 Miles to Border

Berne, Switzerland. — Lieutenant Thomas Hitchcock, Jr., of Westbury, L. I., who, when a member of the Lafayette Flying Squadron last March was captured by the Germans, has escaped from a German prison camp and arrived here.

Hitchcock, who is only 18 years old and is the son of Major Thomas Hitchcock, jumped from a train near Ulm, in Wurtemberg, and walked eighty miles to the Swiss border, near Schaffhausen. The aviator is returning to the United States immediately. Lieutenant Hitchcock was reported captured on March 6, this information reaching his parents through the International Red Cross at Geneva. According to that report, he fell behind the German lines after he had been wounded in battle with three enemy planes. He was first taken to the prison camp at Saarbrücken, and later was transferred to Giesen, and again to a camp in Bavaria.

Before the United States entered the war, Lieutenant Hitchcock was recognized as an expert horseman and polo player. He was a student at St. Paul's School, in Concord, N. H., last year when he presented himself for enlistment in the aviation service. Although he passed the 100 hours' endurance test in the air, he was rejected because of his age.

In June, 1917, he went to France, where he had further training in the French air service. He was then assigned to the famous Lafayette Escadrille with several other Americans. Last February he brought down two German fliers, and received the Croix de Guerre with two palms and the prize money awarded by the Lafayette Escadrille. After he had been flying for several months he was promoted from Corporal to Sergeant. He had not been transferred to the United States forces when he was captured, and last July when he was still a prisoner, he was made a Lieutenant by General Pétain in recognition of his "gallant work."

Gives Hospital for Fliers

Washington.—The War Department has accepted the offer of Edward S. Clark of Cooperstown, N. Y., to use the Mary Imogene Bassett Hospital and Pathological Laboratory at Cooperstown for the period of the war and one year after. It will become a general hospital, where special attention will be given to nervous conditions among aviators.

The hospital, which is being erected at the present time, will be ready for use early in 1919. It is a stone building of fireproof construction, consisting of one main building and wards with accommodations for 185 patients, power house, nurses' home, pathological laboratory, garage, and employes' dormitory, all situated in a large tract of ground.

Mr. Clark's only stipulation as to the use of the hospital and grounds was that the Government should not intentionally bring in any patients suffering from contagious diseases, and that the property should be returned in as good condition as when taken, making allowances for ordinary wear and tear.

One hundred beds and full equipment necessary for caring for that number of patients will be provided by Mr. Clark. The balance of the equipment is to be furnished by the Government. In the event the hospital is finished before the other building are ready, Mr. Clark has placed at the disposal of the Government a small hotel to be used till the buildings are ready.

American naval aviators starting out in a French naval dirigible to patrol the French coast for U-boats

United States War Flier Writes from London

Writing from London, England, Corporal Jack Irving, Jr., mechanician in a United States Aero Squadron, describes part of his work in a letter to his father, Mr. J. C. Irving, past president of the Pacific Aero Club and now official representative of the Aero Club of America in San Francisco. Young Irving says in part:

"I am enjoying a dandy trip this evening and am writing this note in the clouds 6,500 feet over London. The noise is terrific, but I am shielded from the wind and am quite able to handle a pen. The cold is becoming very noticeable now, as I have on only my street clothes and didn't even stop to put on a helmet. We are now so high above the clouds that I can't see the jolly old earth. I surely enjoy this game, especially when the weather is good.

"This trip is over London and up the Thames about thirty-five miles, thence across country at an altitude of 8,000 feet and dropping to about 300 over a small town near London. We are in a big British plane and there are fifteen of us in the machine.

"London is a riot—the greatest place ever invented—and the Yanks get a big hand at every turn. We are billeted in a couple of old mansions about forty minutes from the Strand. Our training has begun in earnest and is quite exciting, as we get the real stuff, from tuning up the big machines to trying them out. A few days ago I made a two-hour trip over London. We climbed to an altitude of 15,000 feet to test the altitude correctors, and on my return I was made a corporal. I won't be satisfied, however, until I'm engine or flight sergeant.

Every machine that we turn out goes through the loop, nose dive, flip-over, etc., for a test, so you can see we flight mechanicians have all the fun. We make up for it, however, for frequently we have to do twenty-four hours' straight engine work."

War Department to Take Advantage of Senate Inquiry, Says Mr. Baker

Daily press interview by Secretary Baker:

"I have read only the newspaper summary of the report of the subcommittee on aircraft of the Senate Committee on Military Affairs. Many of the details and difficulties discussed by the report seem to have been corrected, and the conclusion reached by the committee that substantial progress is now being made will be very reassuring to the country.

"In the meantime, of course, the War Department will examine with great care the full text of the report and all the evidence taken by the subcommittee, of which a copy has recently been supplied to the department. Our effort will be to take all possible advantage from the inquiry which the subcommittee has made and to give most careful consideration to its recommendations and findings."

Corporal Jack Irvine, Jr., 372 Aero Squadron

Overseas Checks Possible

Checking accounts can be opened with the Guaranty Trust Company's London or Paris offices, and can be used on the other side practically the same as in the United States. Commissioned officers having a checking account at the Paris office have the additional advantage of being able to cash checks thereon at the leading French banks. This arrangement is also of especial advantage to regimental or company fund treasurers. Arrangements can also be made whereby checks on home banks in the United States can be cashed in numerous places throughout France. Among the other services offered is one whereby relatives or friends in this country can open credits for men in service on the other side.

The Guaranty Trust Company of New York maintains offices in London and Paris, as well as a special office for the service of the American Expeditionary Forces at Tours, France. The facilities of these offices are at the disposal of Americans in all branches of the service.

In connection with two other trust companies it has been designated as a distributer of service checks approved by the United States Government.

Ryan Quits Copper Company

John D. Ryan resigned on September 4 as president and director of the Anaconda Copper Mining Company and C. F. Kelley, a vice-president, was chosen to succeed him. After a special meeting on September 4 of the board of directors the following statement was made:

"John D. Ryan, on account of the necessity of devoting all of his time to the service of the Government as Director of Air Service, has tendered his resignation as president and director of the Anaconda Copper Mining Company for the period of the war.

"At a special meeting of the board of directors held September 5 Mr. Ryan's resignation was accepted and C. F. Kelley, a vice-president and director of the company, was elected to the presidency."

Wall Street assumed September 4 that Mr. Ryan would probably resign from his other corporate interests. He is president of the United Metals Selling Company and the Montana Power Company and is vice-president of the Greene Cananea Copper Company. He is also a director of the Mechanics and Metals National Bank of New York, of the St. Paul Railroad, the American International Corporation and of the Inspiration Consolidated Copper Company. He is a trustee of the American Surety Company and is also a director of the Emigrant Industrial Savings Bank.

Enlarging Flying Field Areas

For the extension of instruction in gunnery and in order that more flyers may be trained on this side of the Atlantic, the Division of Military Aeronautics, on the approval of the Secretary of War, is now leasing land for target practice near the larger flying fields. A tract of 10,000 acres has just been leased outside of Fort Worth, Texas, and not far from Taliaferro, Barron, and Carruthers Fields. Within a few miles of Hazelhurst Field, Mineola, Long Island, and fronting on the South short, another tract of 750 acres has been leased at Wantaugh, known as Lufbery Field, and additional marshy land is being secured. A piece of fifty and one-half acres, adjoining Mineola Field, has been leased and has been leveled for a drill and exercise ground.

Many Changes at Langley Field

During the past week the personnel of Langley Field has changed materially. Major Roy Brown, who was acting as commanding officer during the absence of Colonel Patterson, has been transferred to Camp Oglethorpe, Ga.; and Major C. W. Howard, formerly Commanding Officer of the Aerial Observer's School, has assumed command of the Post. Captain Carolin, formerly in charge of the flying field, has been transferred to Washington and Captain T. Arter has taken Capt. Carolin's position. Major Oliver is now the Chief Executive Officer, and Lieut. J. J. Matthews is the Post Adjutant. Lieut. A. F. Scott, who has been the adjutant, has been awarded a captaincy; Major Arthur G. Coumbe has recently come to the Medical Department.

Aviation Bombing Field at Ellington

Six new steel hangars, costing between $9,000 and $11,000 each are being constructed at Ellington Field, one of the Gunnery Schools of the Air Service, at Houston, Texas. The new hangars will be used in connection with work in bombing which is soon to be started. Three hundred and thirty-three acres of land near Ellington Field have been secured for the bombing field. Troop labor is being used in the construction work. Beside the main field known as Ellington, there are five auxiliary fields near Houston, all of which are used in the training of flyers. New extensions include the utilization of land at Park Place and on the gulf, near San Leon, Texas.

Oversea Flyers to Train Cadets

Experienced flyers are being returned from abroad to act as special instructors in the more advanced courses of aviation training, the War Department announces.

"Recent practice in elemental training gives the candidate more time in the air with his instructor than heretofore," states the announcement. "The new plan is known as the Gosport system, or "All Thru," as it is popularly known here, and insures closer contact between the cadet and the instructor."

When the cadets arrive at a flying field from a ground school, where they have learned much of the theory of flight, several are assigned to an instructor, who stays with them until they have qualified in elemental flying. They are then sent to special schools for final work and training in their particular line.

"The old practice of turning a cadet loose for his first solo flight in a sink or swim fashion is being discontinued," the War Department states.

Dunkirk Raided 200 Times

Paris—The little town of Dunkirk on the English Channel holds the unenviable record of being the most bombarded city in the world. Within the last few days Dunkirk has suffered her 200th air raid. Since the war she had experienced more than 400 alarms, about one-half of them accompanied by a shower of shells from aeroplanes, Zeppelins, destroyers at sea or long-range guns.

Here is Dunkirk's bombardment score compiled to date:

Alarms not followed by raid	211
Aeroplane raids	199
Bombardments by German long-range guns	25
Bombardments from sea	4
Zeppelin raids	1

Aerial Photography Changes Things

Aerial photography has greatly altered military methods, for now it is impossible for one side to dig a small "sap," erect a few strands of barbed wire or to construct a new machine gun post without the other side's knowing it almost at once.

Not only can constructions of a tactical importance near the "lines," such as trench railways, dumps, battery positions and communication trenches, be recorded in detail by aerial photography, but strategical constructions and works, such as new railway lines and sidings, aerodromes, camps and rear defense systems, can be photographed and revealed to the last sleeper or smallest aeroplane hangar by the all-seeng camera.

Lieut. Wesley Benner, flying officer in charge of formations at Chanute Field

Aeroplane cameras are inclosed in armor-plated steel boxes tapering toward the lens, and usually are specially fitted to the aeroplanes in which they are to be used.

Reed Has Left for France

Senator Reed, of the Senate military affairs committee, has left Washington to visit the battle fronts of Europe, and especially the American sectors. He goes in a quasiofficial character, bearing letters from Secretary Lansing, Secretary Baker and Gen. March, chief of staff.

Senator Reed has made a special study of aerial warfare and was a member of the subcommittee which conducted the aircraft investigations. He will pay special attention on the front to the war in the air. He also will study the situation with reference to the man power which must be supplied by the United States.

Paris.—Sergeant William McKerness of Wallingford, Conn., attached to the Lafayette escadrille, was killed in a fight with eight enemy aeroplanes August 15. The sergeant was flying with a French pilot and their machine was accompanied by two French aeroplanes.

Eight German machines appeared and the French aeroplanes boldly attacked them. They kept up the unequal fight until the machine in which McKerness was flying crashed to the ground in flames. The bodies of McKerness and the French pilot were picked up within the French lines.

Dutch Intern Two American Airmen

London.—A battle between Allied and German aeroplanes was fought August 16 around Zeebrugge, on the northern coast of West Flanders, according to an Amsterdam dispatch to the Exchange Telegraph. During the fighting, which lasted nearly all day, Lieut. Regan Harris and Sergeant James Muir, Americans, had their machine disabled and were forced to land on the Dutch island of Zeeland. They were interned along with the occupants of a British aeroplanes that descended.

London.—News has been received here to the effect that one of the American naval air stations in Italy was recently attacked by a large force of enemy aeroplanes which dropped more than a dozen heavy bombs, none of which did any damage to the station.

American aeroplanes and anti-aircraft guns beat off the enemy machines.

Washington.—Naval officers believe the reported American air raid on Ostend and Zeebrugge, the German submarine bases, may mark the beginning of a series of attacks carried out by all-American seaplanes equipped with Liberty motors and operated by American aviators.

It is presumed here that the heavy bombing planes which the navy has shipped overseas and which carry eight machine guns were used in te reported raids. These heavy machines are also able to accommodate a considerable number of bombs.

As no official advices have yet reached here, it is not known whether the last raid occurred by day or at night. A flight made in the day time would mean that an altitude of at least 10,000 feet would be maintain over the bases, while at night the machines might venture much lower.

The navy has been expecting to hear about the beginning of these raids for some time. It is regarded as likely that the machines flew from Great Britain.

Paris.—The *Official Journal* of August 20 prints the citation of Flight Lieut. Schuyler Lee of New London, Conn., formerly of the Lafayette escadrille, who was killed in an air battle east of Montdidier in April.

The citation praises the courage and dash shown by Lieut. Lee since his first days at the front, notably on February 3, when he helped to bring down eight enemy machines.

Poet Airman Raids Pola for Revenge

Italian Headquarters at the Front.—Major Gabriele d'Annunzio, Italy's poet-airman, who led the raid on Vienna, has carried out an adventurous personal reprisal for an Austrian night air raid during which one of the enemy machines dropped a bomb literally within yards of his sleeping quarters. The bomb did not explode, but its impact knocked over and broke a glass from which d'Annunzio had drunk an hour before. The soldier-poet gayly started off in the afternoon with his pilot in a new type of a fast, weight-carrying land machine, flew about 100 miles straight across the Adriatic Sea to Pola, the Austrian naval base, dropped fourteen bombs on the arsenal and returned safely to his aerodrome.

D'Annunzio will wear henceforth in his flights an ivory-hilted dagger. This weapon is the distinctive mark of the Italian storm troops, and all the eight airmen who took part in the raid on Vienna have been named by their comrades "The Storm Troops of the Air."

American Official Communique No. 99

Headquarters American Expeditionary Forces, Aug. 21, 1918.—Section A—Yesterday our aviators successfully bombed the railway at Flabeuville. All our machines returned.

Aug. 22, 1918.—Section A—Northwest of Toul one of our aviators shot down a hostile machine. An August 21 and 22 our aviators successfully bombed the railroad yards at Longuyon, Audun-le-Roman, and Conflans. Three and one-half tons of bombs were dropped and many direct hits were observed. All our machines returned.

Aug. 24, Section A.—Our aviators successfully bombed the railroad yards at Conflans. All our machines returned.

The Committee on Public Information issues the following:

The Navy Department has received a report from Admiral Sims that American naval aviators conducted a successful bombing expedition at night into enemy territory and dropped a large quantity of explosives on the submarine docks at Ostend.

Navy Department advices confirm the fact that American naval aviators were now engaged in active bombing expeditions and recently dropped several tons of explosives on the docks of Ostend, the German naval base, according to advices from Admiral Sims.

With the American Forces on the Lorraine Front.—Three German aeroplanes brought down in one day, a record for American aviators, have been credited to Lieutenant Donald Hudson, a son of Paul Hudson, of Washington, D. C. Official confirmation by the French authorities has just been made, adding his name to those of the other aces of the American Army.

Lieutenant Hudson accounted for the three German machines on August 1 when the American forces were fighting for possession of Saponay. He was engaged by one aeroplane when well up in the air. His engine failed, but he ran on "pressure," although all the time sinking over the German lines.

Finally Lieutenant Hudson managed to get over one German battleplane and shoot it down. Then he tried to escape to his own lines, but was pursued by the remaining two enemy planes. When at a height of only about 1,000 feet he outmanoeuvred both machines and succeeded in sending them both crashing to the ground. The lieutenant landed his own aeroplane well behind his own lines. The entire engagement lasted twenty minutes.

With the American Army on the Vesle Front.—An account of the aerial operations carried out by an American squadron over the German lines, from which Lieutenant John McArthur, of Buffalo, N. Y., failed to return, shows that McArthur and his formation met superior German formations when almost thirty miles north of the American lines. They also encountered heavy anti-aircraft firing. The engagement took place north of the Aisne.

McArthur and one other airman failed to return to their lines. Three planes came back, but the pilot of one of them was so badly wounded that he died in the hospital. His name and that of the second aviator who failed to return have not been made public.

The AIRCRAFT TRADE REVIEW

N. E. J.

Enough Cotton Fabric for Planes

Washington.—The production of American cotton aeroplane fabric is now averaging about 1,200,000 yards monthly, sufficient for all requirements, and capable of being largely increased if necessary. No more linen fabric is being imported from abroad for this purpose, and after the imported stock now on hand is exhausted, cotton fabric will be used exclusively in covering American aeroplane wings.

At the outbreak of the war in 1914, linen was the only material which had proved entirely satisfactory for covering aeroplane wings, the essential physical properties required being lightness in weight, proper absorption of dope and strength and resistance to tear.

The chief countries before the war producing flax for fine grades of linen were Belgium, Russia and Ireland. The Belgium supply was cut off from the Allies in 1914. Russian flax was difficult to obtain and was later cut off entirely. In the meantime the consumption of linen for war purposes had increased enormously. By the spring of 1917, when the United States entered the war, the linen situation was very serious and it was obvious that some substitute would have to be found.

In developing a cotton aeroplane fabric which would have the necessary qualities of the linen, the U. S. Government received the greatest assistance from the various cotton mills.

Samples were made from cotton of many constructions and numbers of yarn, varying from No. 40 two-ply to No. 100 four-ply, the cloth having from 50 to 90 threads per inch. Yarns were in some cases mercerized under tension and various twists were tried. Several cotton mills co-operated in this work.

When the new fabrics were secured, samples were put on aeroplanes, "doped" and varnished, according to regulation practice, and tested in actual use at Langley Field and Pensacola. Flying tests were also made with several other varieties of fabric. The tests were for three months of service, averaging ten hours per day. Members of the U. S. Air Service, members of the foreign flying corps and other experts assisted in the experiments. They reported that the cotton fabrics developed in the United States appeared to serve most favorably. Other very favorable reports have recently been received from tests made in Great Britain on American cloth sent over there.

After many experiments had been made, the first contracts for 10,000 yards each of cotton aeroplane fabric were placed in the middle of September, 1917. The results obtained were satisfactory and it was decided to place further contracts.

Two fabrics were adopted, the specifications calling for a strength of not less than 80 pounds per inch in both warp and filling. The cotton used had to be of a very long staple, and in November, 1917, the Air Service purchased 15,000 bales of long staple Sea Island cotton.

The first quantity orders for cotton aeroplane fabric were placed in October and November, 1917, and were for 1,280,000 yards of Grade A and 200,000 yards of Grade B. Deliveries of cotton aeroplane fabric started in January with the production of 173,000 yards. Production has gradually increased until at the present time 1,200,000 yards are being produced monthly.

Subsequent contracts have been let for cotton aeroplane fabric amounting to 11,513,084 yards. All of these later contracts, however, have been for Grade A cotton fabric, as is now seems clear that this cloth is superior to the other.

While the cotton aeroplane fabric was at first used only for training planes, and the Grade A standard linen fabric, which was imported from Great Britain, was used for combat planes, it was decided in April, 1918, that the Grade A cotton fabric could be used for all types of planes.

Talking Machine Co. Builds Aeroplane

Philadelphia.—The first scouting hydro-aeroplane made from parts manufactured by the Victor Talking Machine Co. of Camden has had a successful tryout. The plane was piloted by Lieutenant G. H. Pumpelly, who put it through its paces. The test showed the machine is capable of turning in a remarkably small area. Plain and fancy diving were features of the exhibition. The start was made from the Philadelphia Navy Yard at League Island, where the machine was assembled.

To Regulate Crude Oil Prices

Washington, Aug. 20.—Prices of gasoline and other oil products will be stabilized, and steady production of petroleum will be assured by a plan now being worked out by the National Petroleum War Service Committee in co-operation with the United States Fuel Administration. Maximum premiums will be arranged for payments for various qualities of oil.

Heretofore competition has caused various refiners to bid against each other and pay excessive premiums over the base rate for oil. This has resulted in exorbitant consumer's prices, and has also created disturbance in the oil industry, frequently hampering oil production.

By means of the maximum premiums it is expected that permanent prices for crude petroleum will prevail and that its proper production and distribution will be assured. Protection will thus be given to both small and large refiners in securing their supplies, while at the same time consumers will be insured against excessive prices for gasoline and other oil products.

U. S. Now Makes Its Own Castor Oil

The scarcity of castor oil which for a time loomed large as an obstacle to this country's ambitious aeroplane program and also seriously threatened the production of important leather substitutes, has been successfully overcome, according to recent government announcement.

When the insufficiency of the castor oil supply became apparent, 6,000 tons of castor beans were imported and planted last spring in sections of eight southern states—California, Cuba, Hayti and San Domingo—on government contracts. The result has been exceedingly gratifying, as the crop to be harvested next month will net more than 2,000,000 gallons of first grade oil. This amount added to the supply on hand will fill all industrial and medicinal needs for a year.

Castor oil is an essential factor in the building of aeroplanes equipped with rotary motors. Hundreds of such machines are on the building schedule and motors of this type must have castor oil for a libricant.

Thousands of gallons of castor oil are used yearly in the making of leather substitutes of the pyroxylin coated type, which, since the outbreak of the war, have performed invaluable service in releasing leather for the country's vital military requirements

The success of the experiment of planting castor beans in this country adds another paying crop to the list in the sections named and, in all probability, in adjoining areas. It also relieves the United States of the necessity of depending on imports for its supply of castor oil.

War Department Gives Manufacturers Information on Contracts

Washington.—In order that the manufacturers can learn full information regarding the needs of the War Department, the General Staff will place manufacturers on the mailing list and send each of them requests for bids for the products which he is able to provide. Manufacturers, in sending in their names to the Supply Bureau, Director of Purchases and Supplies, General Staff, U. S. Army, Washington, D. C., should also include satisfactory references from banks or reputable business concerns, or from the chairman of the Local Regional Manufacturers Organization associated with the War Industries Board.

Silver Spruce

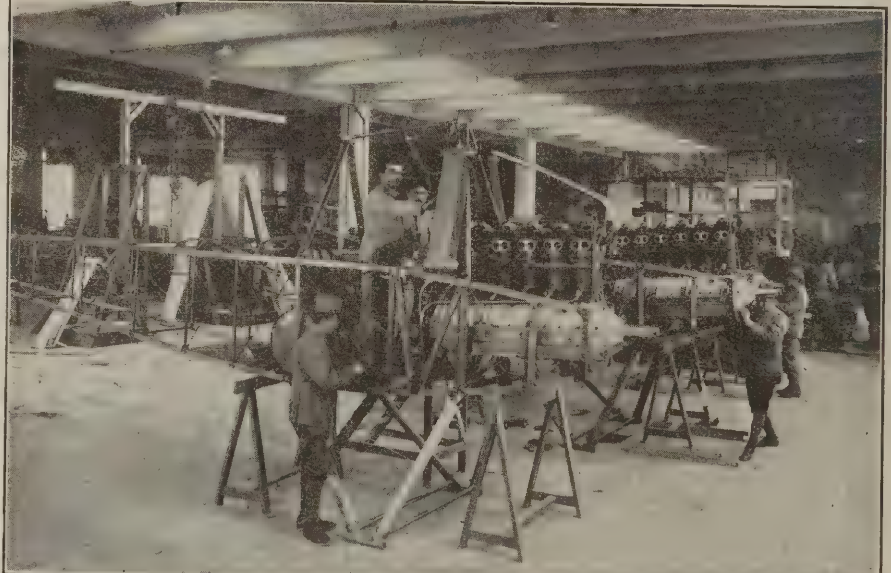
Silver spruce, which grows by the millions in British Columbia, once was despised by lumbermen. Today this timber is considered one of the most valuable, inasmuch as the wood answers all requirements for aeroplane propellers and other wooden parts of military flying machines.

Starting Device Adapted to Aircraft Engines

Milwaukee.—A starting device for heavy duty engines, designed several years ago by Nels A. Christensen, a noted inventor and engineer of Milwaukee, principally for application to motor fire apparatus and similar purposes, has been refined by him to suit the requirements of aircraft. Several hundred hydro-aeroplanes in use at the navy aviation camp at Great Lakes, Ill., have been equipped with the starter. Mr Christensen personally superintended the installations and made numerous practice flights to demonstrate the efficacy of the apparatus. He is president and general manager of the Christensen Engineering Co., 816 First National Bank Building, Milwaukee.

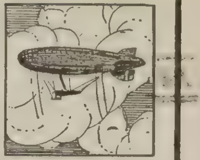
Chinese Government Orders Hall-Scott Motors

The Chinese Government has placed an order for one A-7a Hall-Scott aeroplane engine with the Hall-Scott Motor Car Company, West Berkeley, California. The engine is to be used for training plane purposes. It is of the dependable four cylinder type of Hall-Scott engines, and except for the difference in cylinder bore of ¼ inch, is practically identical with the well known A-7 four cylinder model, which has been used so successfully by the United States Government in its training planes. The additional ¼ inch in the bore of the cylinder gives an additional h.p. rating of 10, at 1,400 r.p.m., making the engine develope 100 h.p. instead of 90, as the A-7 type is rated at.



An interior view of the famous S. V. A. factory in Italy

MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

UP to a few years ago, in the public mind all balloons were associated with parachute jumpers, county fairs and circuses. They were used very much like their rival, the old side show—full of freaks—solely to draw a crowd. Today Uncle Sam is making balloons and training their operators for distinctly another purpose. The ungainly old balloon of circus days is now a rival of its smarter and more modern brother, the aeroplane, in the job of being eyes for the army and navy.

Swinging far aloft at the end of a cable these "sausages," as they are called, support trained observers, who by means of powerful field glasses and telephones give range and direction to batteries. These, in turn, with well directed shots put enemy batteries out of business and break up infantry forming for attack. The most accurate information can be given from a stationary point—the higher this point, up to a certain limit, the better. Therefore a stationary balloon four or five thousand feet in the air is an ideal place for an observer.

So Uncle Sam's parachute jumpers are being instructed today, not as entertainers to draw and thrill crowds by "leaps from the clouds," but for their own personal safety and the safety of their records, made at high elevation, when a shell or an enemy aeroplane destroys their balloon, and they have to jump. Though their balloon may be destroyed, the men in the basket usually come safely to earth and bring their maps and photographs with them. It is a life full of excitement these men of the balloon corps lead, and to be a member one has to have plenty of nerve, courage and daring.

Aviators take off their hats to the balloon men. One recently returned American air pilot told of an adventure he had on a trial trip in a balloon; how interested he was becoming in the work of the observer as the latter explained the great panorama outstretched below him. Suddenly the balloon man interrupted his talk to see that his parachute straps were O. K., climbed to the edge of the basket, shouted "Beat it! Follow me!" and disappeared over the side. The aviator said he took one look at the windlass pulling the balloon to earth below, another at the oncoming enemy plane, and said to himself, "Not for mine." He said he did not have the courage to jump. Fortunately the enemy plane was beaten off by Allied planes before it could get any nearer.

In order to make use of the balloon for war purposes the Government practically had to revive a dead industry. Uncle Sam's army balloons, like the European war types, are not of the spherical variety which some of us have seen at circuses and fairs; in fact, they are not free balloons at all, but captive balloons.

Since a free balloon after leaving the ground, is controlled entirely by wind currents, its use for observation purposes is nil. The same is true also of the old spherical balloon, held captive by a strong cable, which acts exactly as does a toy balloon on a string, bobbing and swaying from point to point, never remaining quiet long enough to permit any sort of observation.

It was, therefore, necessary to design a special balloon for observation purposes, something that would remain steady and on an even keel. Some years ago Germany developed a fairly satisfactory yet somewhat treacherous balloon. France and England also conducted balloon experiments, but the old German Drachen balloon dominated the field. In the United States the only work done was by one manufacturing concern. On the Mexican border in 1916 the United States Army had only one locally designed captive balloon, which was a gift to a National Guard battery, so at the beginning of the present war there was no really satisfactory observation balloon in the army.

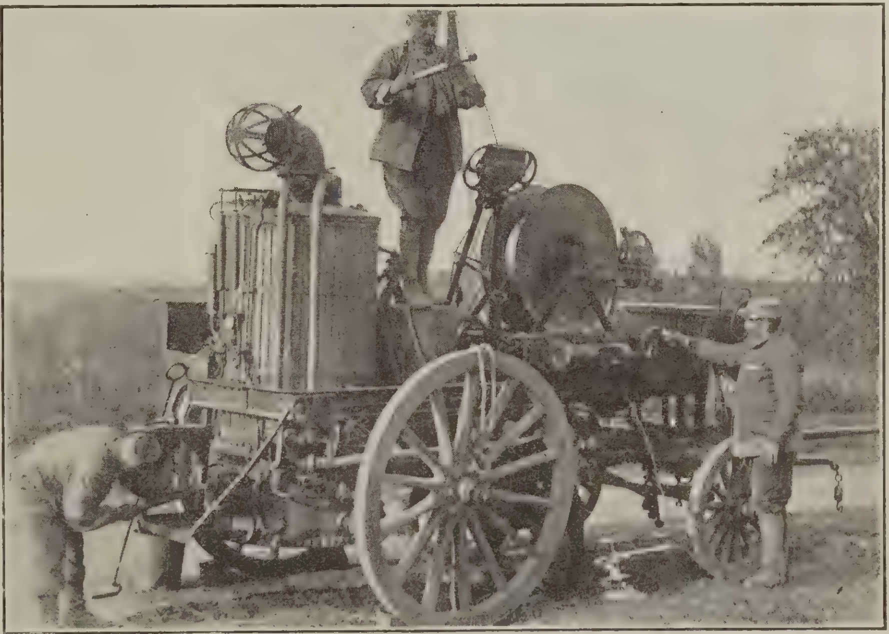
The present American and Allied observation balloons are built along the lines of the "Caquot." They are non-rigid and designed to remain steady in varying winds and to reach a satisfactory altitude for necessary observations. The gas bag is larger in diameter at the nose or forward end, which heads into the wind, than at the tail. It is approximately 93 feet long, with a maximum diameter of approximately 28 feet and its capacity is roughly estimated at 1,000 cubic meters or 35,000 cubic feet. At the tail of the balloon is the "rudder," which steadies it and keeps it from rocking and pitching.

The United States Government began its production working on a sample balloon from the front. Troubles started at once. The duplication of a foreign-made article was not as easy as it seemed, especially when production in quantity was necessary. In the first place, the manufacture of balloon fabric had been only partially developed in the United States, and it was difficult to get the proper material. Nevertheless a ready supply of the necessary fibre was obtained and, through co-operation of the mills, the required number of looms were adjusted. After a necessarily slow beginning the manufacture of proper cloth was begun in quantity.

The industry was new and speed was essential, and before the manufacturing process had been very long in operation, it was found necessary to bring over from France a number of experienced men and women to work as instructors with Americans.

Besides an efficient labor organization, other things required in balloon factories were plenty of free and open floor space, plenty of light and a complete absence of dust and dirt. All these things had to be obtained, and the only way it was done was by sacrificing other lines of business. This took some time, but when the balloon schools in the United States called for balloons they did not have to wait. As school developments and increases took place, and as balloon companies went overseas, the balloons necessary were on hand. Today the United States has equipped her own army, and in addition is in a position to help supply her Allies as well. And equipping an army with balloons means more than the original supply. It includes also the replenishment supplies to keep pace with losses by fire, accidents, enemy aeroplanes and artillery or what not.

(To be continued)



This illustration shows one of the first winches used in connection with kite balloons. As will be noticed, it is horse-drawn. Instead of the modern reciprocating automatic adjustment cable drum, this winch uses a single action drum, which is awkward and liable to be dangerous. It is steam-operated. The boiler will be seen at the rear of the truck and the engine on the right. A spark catching device is seen covering the smokestack. These winches were in use up till a comparatively short time ago, when the more modern gasoline driven winch took its place. A photograph of the latter will appear on this page in an early issue.

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

US AERIAL MAIL

AERIAL MAIL PILOTS
- Max Miller
- Maurice A. Newton
- Robert Shank
- Ed. V. Gardner
- C. D. De Hart

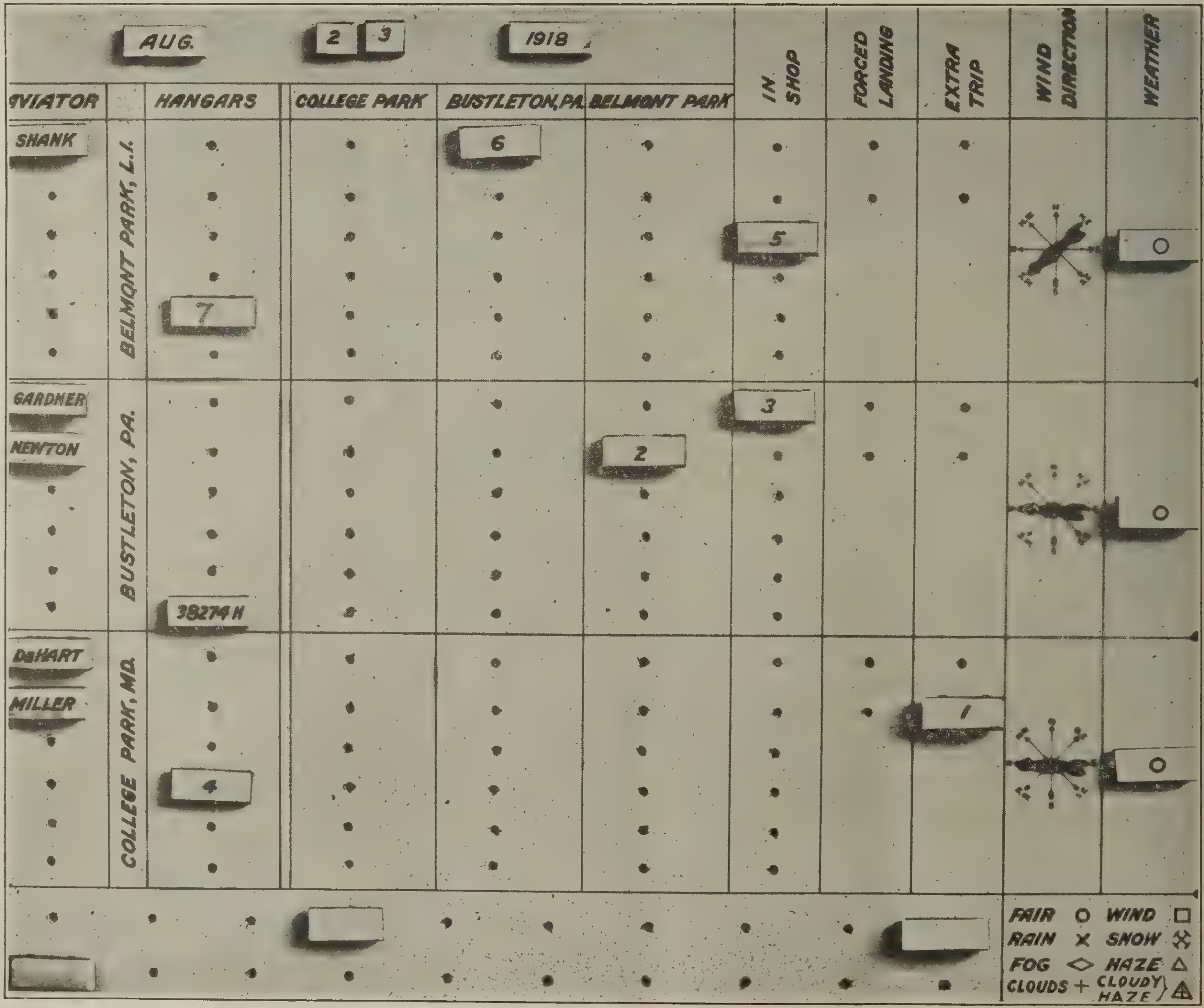
Aerial Mail Aerodromes:
College Park, Md.
Belmont Park, L. I., N. Y.
Bustleton, Penn.

AERIAL MAIL MECHANICS
- Henry Wacker
- E. N. Angle
- A. F. Cryder
- Ed. C. Roll
- Wm. C. Read
- W. O. Beatty
- Chas. King
- A. C. Danielle

THE DISPATCH BOARD INVENTED BY CAPTAIN BENJAMIN B. LIPSNER, CHIEF OF THE AERIAL MAIL DIVISION, POST OFFICE

CAPTAIN B. B. LIPSNER, the enterprising chief of the Aerial Mail Division of the Post Office, has invented a very useful dispatch board to keep track of the aerial mail aviators, machines, etc.

The Dispatch Board consists of a board, 24″ x 24″. The board is made of wood with the necessary information lettered on a piece of cardboard the same dimensions placed on same. It is covered over with celluloid, insuring against any mar-



The Aerial Mail Dispatch board invented by Capt. Benjamin B. Lipsner ring of the lettering on the card. The various names and numbers which represents the aviator or aeroplanes are carried out in the following scheme: a flat piece of wood with a tapered plug extending from the center thereof, with sufficient space to slide a card with descriptive matter, whether it be name of aviator, plane number, date, etc., between the flat piece of board and the celluloid, so that number of a plane or name of a pilot can be easily replaced. The month, date and year is also carried out in the same manner. In other words if we desire to make the date read, "August 24, 1918," we remove the plug "3" and place in its stead plug "4'; thus reading "24" instead of "25." If Gardner reaches College Park from Bustleton in ship 38262 we remove plugs bearing Gardner's name and ship he flew into space provided under College Park.

Each column is self-explanatory. Wherever the aviator is stationed or wherever the aeroplanes are located, the plug with the name of the aviator or the number of the ship is pushed into the holes that have been provided for same on this board. If a ship happens to be in the repair shop, you will note a space has been provided for same, and the plug will indicate with the number thereon in that column. You will also note a column for forced landing. The wind direction at each point is shown by an arrow with a reproduction of compass directions as noted. This is placed in the direction as reported. As you will note on the photographic chart that at Belmont Park on August 23 it was reported that the wind was in a southwesterly direction.

The weather, you will note in the last column, is taken care of with the same removable wooden plugs, and is taken care of by symbols. On the photograph I have omitted two weather conditions which are symbols for clouds and cloudy haze. Cloudy weather will be represented by a cross (+) and a cloudy haze by a cross in a triangle (△); thus completing eight different weather possibilities. The chart as shown gives the following information: Aviator Shank is in flight to Bustleton with ship No. 6, while two other ships remain in the hangar ready to fly and ship No. 5 is in shop undergoing repairs (the other two ships should be omitted by your artist as the writer does not want to show a number of ships under repairs). The next leg shows Gardner in flight from Bustleton to College Park, using ship No. 38262. Aviator Newton is in flight from Bustleton to Belmont Park with Ship No. 2 (one ship to be in repair shop here). The direction of the wind as reported is in a westerly direction; weather fair; two ships in flying condition (on the photograph one only is shown. Also show another aviator ready to make an emergency flight).

At College Park you will note DeHart flying from College Park to Bustleton in Ship No. 38275. Miller is making an extra trip on that date with No. 1 by piloting DeHart on his course. The wind as reported is in a westerly direction; weather fair. Ship No. 4 and ship No. 38278 are shown in reserve.

The system is a matter of simplification so as not to consult too many reports. In conclusion, at the completion of all flights the removable plugs representing the number of plane and the aviators as well are then placed at the respective points of destination which they were flying to, and the dispatch board on the following morning represents accurately where the aviators and various ships are actually located. In this manner you can readily see how easy it is to know where your men and your equipment is located; what ships are in the shop, wind direction, etc. By having a photostatic copy made of this board each evening prior to removing the plugs enables us to have a permanent copy of each day's activities and represents a permanent and complete record for the flying activities of each individual day.

The Lipsner Dispatch Board is to be manufactured by Joseph A. Steinmetz of Philadelphia, Penn.

First Aerial Mail Letter Reaches Our Commanding Officer

The first communication to reach March Field via aerial mail arrived Aug. 22, addressed to Major Bartholf, Commanding Officer, from Henry Woodhouse, member of the board of governors of the Aero Club of America, New York City.

An aerial mail stamp accompanied the letter for return reply which the Major promptly forwarded as follows:

My dear Mr. Woodhouse:

Referring to your interesting letter of August 12th, 1918, commorating the inauguration of the first permanent aerial mail line, I desire to thank you very earnestly for including me in your greetings in honor of this memorable occasion.

No one realizes the practicability and sound judgment displayed in efforts to bring about Aerial Mail Transportation more than flying officers of the Air Service.

I am very happy to be able to congratulate you for your untiring efforts in this regard by return aerial mail.

Thanking you again for your courtesy, I am,

Very respectfully,
JOHN C. P. BARTHOLF,
Major, J. M. A., A. S., M. A., Commanding.—
March Field Flyleaf.

Lieuts. Connell and Carroll Carry Mail From Minneapolis

Chicago, Sept. 3.—Lieuts. S. M. Connell and Earl Carroll, American aviators with the "flying circus" of thirteen British and American aeroplanes, which has been giving exhibitions in many cities, today flew from Minneapolis to Chicago, covering 420 miles in four and one-half hours. The remainder of the "circus" will arrive in Chicago early tomorrow morning.

Lieut. Connell brought with him the first aerial mail between Minneapolis and Chicago, carrying letters to President Wilson at Washington and Alan R. Hawley, president of the Aero Club of New York, from the Minneapolis Aero Club. These will be forwarded when the New York-Chicago aerial mail service is opened this week.

Hun Quits Aero Mail

The Hun aerial post between Budapest and Vienna appears to have been short-lived, the service coming to an end on July 14th through the collapse of the aeroplane at Magyarovar; the two officers were killed and the mail burned.

While it was running, however, the aerial postmen seem to have had their exciting moments, as, according to the Vienna *Fremdenblatt*, two of the officers conveying mails by air from Budapest to Vienna were attacked at a height of 2,000 feet by an immense eagle, which was killed by the propeller. It is not very surprising, therefore, to hear that *the* aeroplane collapsed.

AMERICAN AVIATION HEADQUARTERS' STAFF, LONDON, ENGLAND

Last Row: 1st Lt. Baker, Capt. Swan, Capt. ——, 1st Lt. Goldsborough Davis, Waring, Elliott, 2nd Lt. Newkirk, 1st Lt. Patterson.
Second Row: 1st Lts. Alexander, Bellinger (M. C.), Gwinn, Robertson, 2d Lt., 1st Lt. Fleitmann, Lts. Dwyer, Strhan, Milnor, Owens, Richards, Gallagher.
Front Row: Capt. R. W. Bryant, Capt. C. M. Parker, Peter Fletcher (Director Aircraft Fabrics), Lt. Col. Harms, Lt. Col. Morrow (who was Aviation Officer C. O.), Maj. W. A. Larned, Maj. W. H. Shutan, Maj. Otrubel, R. A. F., Capt. Murray.

THE 240 H. P. 8 CYLINDER MERCEDES

Bore 140 m. m.—Stroke 160 m. m.

(Continued from last week)

According to a report on the aeroplane from which this engine was taken, the main petrol tank (forming the pilot's seat), had a capacity of 50 gallons, and the machine carried an auxiliary tank of 6½ gallons capacity, situated between the pilot's and observer's seats.

[The carbureter is of the same type as in the 180 h.p., but the pilot jet is .5 mm. diameter and the main jet is 2 mm. diam. —Ed.]

Crank-Chamber

Apart from the additional length and the extension of the crankcase casting for the reduction gear, the crankcase, in its general construction, follows the design of the 160 H.P. Mercedes, the bottom half being constructed with a false bottom, below which are the two oil sumps, one at the front and one at the rear end of the base chamber, as shown in the sectional arrangement of the engine (Fig. 3).

Three breathers are provided in the top half of the crankchamber on the exhaust side. The central breather is connected by a large diameter pipe to the air chamber, between the two oil sumps in the bottom half. This air chamber (as shown on Fig. 2) is open on the exhaust side, and communicates with the air intake passages to the two carbureters.

Vertical Driving Gear

The method of driving the camshaft vertical driving spindle (which also drives the magnetos and water-pump, by means of the floating bevel pinion fitted on the rear end of the crankshaft) follows standard Mercedes practice. The details of the construction of the floating pinion with its thrust race, permitting slight longtitudinal movement of the crankshaft without disturbing the mesh of the driving bevels, is well known. The general arrangement of the complete driving gear, including the vertical spindle driving the oil pump worm gear, is clearly shown in the sectional arrangement of the engine (Fig. 3), and also in the detail sketch of the floating pinion (Fig. 11).

Lubrication

A diagrammatic sectional view of the standard 160 H.P. Mercedes oil pump, used on the 8-cylinder type, showing the various leads, and demonstrating the functions of this somewhat complicated pump is given in Fig. 12.

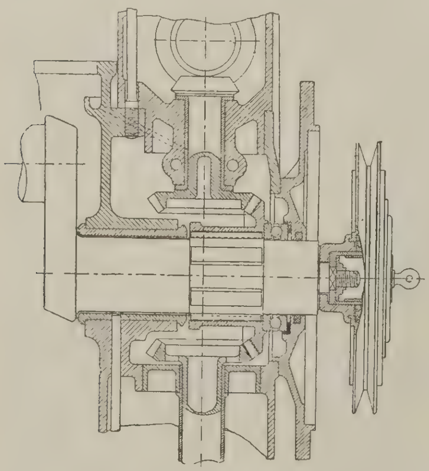


Fig. 11.—Arrangement of floating bevel gear and wireless clutch pulley on rear end of crank-shaft

The oil pump is attached by studs through a flange to a face machined at the end of the bottom half of the base-chamber, and is seasily detachable. It is actuated through worm-gearing by a vertical shaft, driven off the rear end of the crankshaft. In its functions this oil-pump is somewhat similar to the pump used on the 260-h.p. Mercedes, already described in detail in a previous report. Briefly described, the 160-h.p. type of oil-pump embodies three main functions, i.e.,

(*a*) Delivery of oil under pressure from the rear sump, formed in the bottom of the base-chamber to the crankshaft, and connecting-rod bearings by main plunger A.

(*b*) Delivery of a charge of fresh oil at every stroke of the two auxiliary plungers (C and D) from the oil service tank to the main-bearings, camshaft bearings, and valve gear through the hollow camshaft.

(*c*) Suction from front sump in base-chamber to rear sump by the plunger B.

Surplus oil returns to the front and rear sumps in the crank-chamber through perforated steel plates from the overhead camshaft casing through a long trough of sheet brass attached to the underside of the camshaft casing, and through copper pipes leading from the front and rear ends of the trough to the crank-chamber. The reduction gears are lubricated by oil retained in a trough, formed in the lower portion of the reduction gear casing.

Water Circulation

The water pump driven from the camshaft vertical driving-shaft differs slightly from 160-h.p. Mercedes pump, chiefly in the drive. In the 160 H.P. pump the rotor is fixed directly to the vertical camshaft driving spindle by six serrations. In the 8-cylinder Mercedes pump the spindle of the pump rotor is hollow and is driven from the lower part of the vertical driving-shaft by means of a dog clutch. There is a clearance of 2 mm. between the internal diameter of this hollow spindle and the vertical shaft. The rotor floats upon this hollow spindle, and is attached by means of six serrations, which allows a slight vertical movement between the spindle and the rotor. The latter is kept in close contact with the lower face of the upper bearing of the pump spindle by a coil spring.

The diameter of both the inlet and outlet passages of the water pump is 35 mm.

The water jacket capacity of one cylinder is 1,280 c.cs.

In the aeroplane from which this engine was taken a small radiator was fitted in the center of the top plane, having its intake pipe leading from the front details of the construction of the water cylinder of the engine and its outlet leading through the right hand strut of the cabane. Further details of the construction of the water pump are illustrated in the sectional arrangement of the pump (Fig. 14).

Water Pump Test Report

The water pump was detached from the engine and tested separately, coupled to an electric motor. Separate delivery curves were taken against varying pressure.

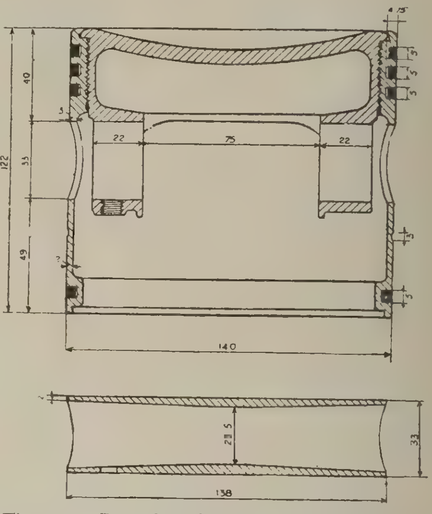


Fig. 6.—Details of piston and gudgeon pin

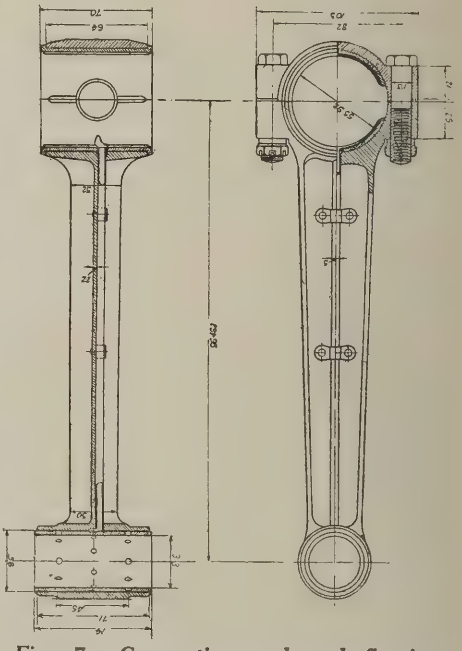


Fig. 7.—Connecting rod and floating gudgeon pin bush

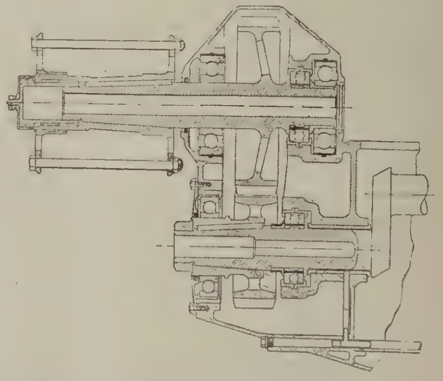


Fig. 9.—Arrangement of reduction gear and airscrew hub

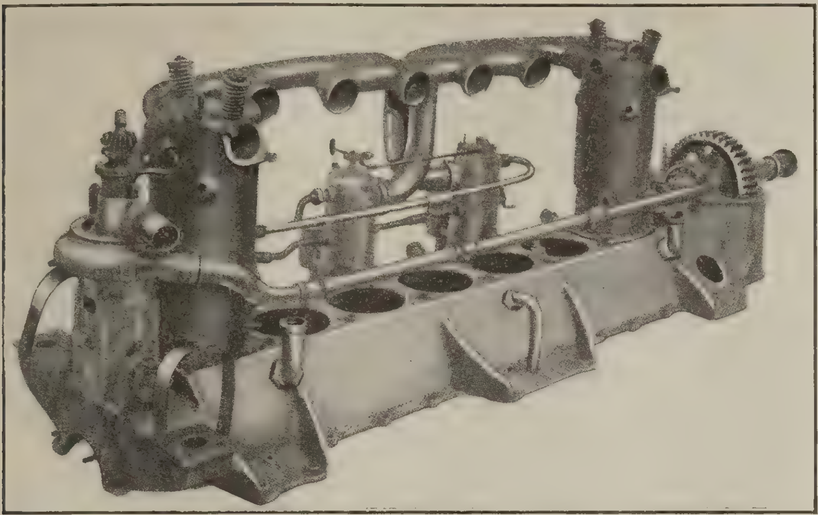


Fig. 10.—Cylinder section of crank-chamber, showing carburetters and inlet pipes and arranagement of water-piping, etc.

At a pressure of 2 lbs. per sq. in, it was found that 1 000 r.p.m. was the lowest speed at which delivery occurred, and similarly at 4 lbs. per sq. in. and 6 lbs. per. sq. in. the lowest delivery speeds were 1,400 r.p.m. and 1,700 r.p.m. respectively. As the ratio of the pump speed to crankshaft speed is 1.5—1, these figures correspond to engine speeds of 667, 934 and 1,133 r.p.m. respectively.

At the normal engine speed of 1,350 r.p.m. the pump is delivering approximately 91 gallons per minute, this figure being estimated from the curves.

On dismantling the water pump it was found that the hollow driving spindle of the rotor was binding on the vertical driving shaft, in spite of the clearance allowed, and also the pump rotor was binding tightly with rust and mud upon its serrations of the hollow spindle, so that no floating action of the rotor or movement of the spring were possible.

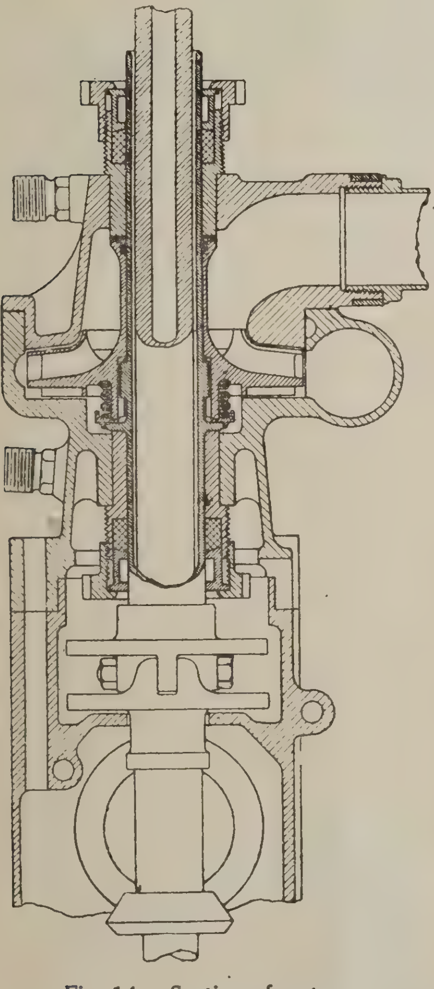


Fig. 14.—Section of water-pump

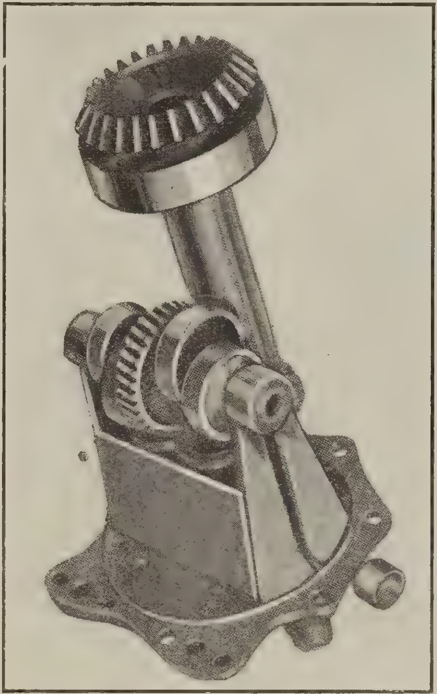


Fig. 13.—View of complete oil pump

Ignition

Two H.L. 8 type Bosch magnetos are fitted transversely on brackets at the rear end of the engine, and are driven as in the 160 H.P. engines, through dog clutches, directly off the camshaft vertical driving-shaft through bevel gears below the water pump, as shown in Fig. 2. The magnetos run at engine speed, and the unusual firing sequence, as already mentioned, is as follows:—1, 3, 2, 4, 8, 6, 7, 5.

The ignition timing is 30° early fully advanced.

Two Bosch 3 point plugs are fitted one on either side of each cylinder, opposite and below each valve.

Wireless Dynamo Clutch-Pulley

A friction-clutch for driving the wireless dynamo is fitted on the rear-end of the crankshaft, details being shown in Fig. 24. This clutch is thrown in and out of engagement by a cable and lever, which can be operated either by the pilot or observer. This type of clutch is now fitted on most of the enemy machines, but was probably first used on the 8-cylinder Mercedes engines.

On reference to Fig. 16, it will be seen that the clutch consists of a "V" driving pulley made of aluminum for taking the belt drive to the dynamo, running upon a double ball race, mounted on an extension of the crankshaft. Inside the rim of the driving-pulley is arranged a pair of semi-circular brake shoes mounted on a plate forming part of the extension which is bolted to the rear end of the crankshaft. The brake-shoes are held apart by two strong coil springs that serve to hold the brake-shoes in close contact with the driving-pulley whilst in action. The brake-shoes are thrown out of engagement by the action of two small levers which compress the coil springs, and so contract the brake-shoes. The brake levers are operated by two striking wedges that are pushed in or out of engagement by the action of the operating rod controlled by a cable and spring from the pilot's seat. To lock the brake-shoes in the "in" or "out" positions, steel balls are used between the ends of the striking levers and wedges, fitted with locking grooves as shown in the sectional drawing.

The brake-shoes are constructed of steel forgings lined with bronze on their outer faces, which bear directly on the inside of the cast aluminum driving-pulley rim.

Air Pump

The air pump of the spring loaded plunger type is fitted towards the rear end of the camshaft casing between the half compression gear and Number 8 cylinder

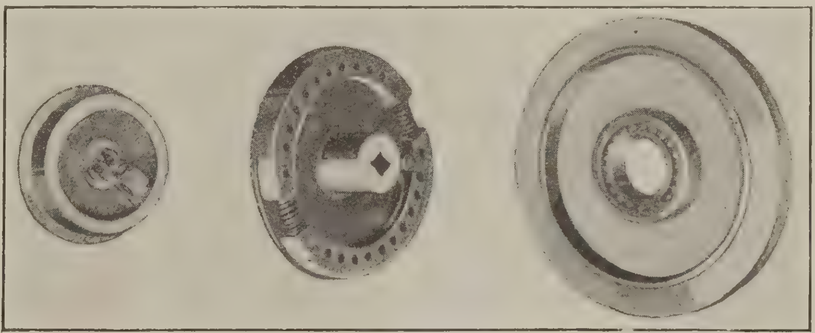


Fig. 17.—View of wireless dynamo-clutch pulley dismantled

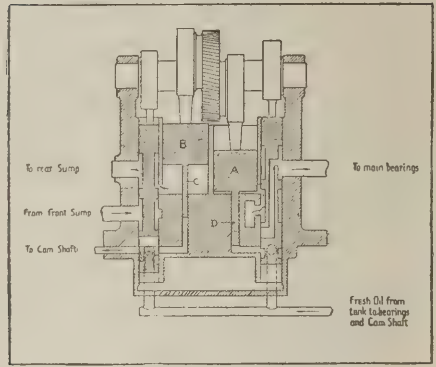


Fig. 12.—Diagrammatic section of oil pump

valve-rockers. The pump is operated by a cam formed on the end of the camshaft. Further details of the air pump are shown in the arrangement of the half compression gear (Fig. 18).

Engine Data

Number and arrangement of cylinders..................	Eight, vertical, separate.
Bore	5.51 ins. = 140 mms.
Stroke	6.30 ins. = 160 mms.
Stroke/Bore ratio....................................	1.142 : 1
Area of one piston.,..................................	23.84 sq. ins = 153.9 sq. cms.
Total piston area of engine............................	190.83 sq. ins. = 1231 sq. cms.
Stroke volume of one cylinder..........................	150.28 cu. ins. = 2463 cu. cms.
Total stroke volume of engine..........................	1202.24 cu. ins. = 19704 cu. cms.
Volume of clearance space..............................	40.30 cu. ins. = 660 cu. cms.
Compression ratio. Total volume/Clearance volume......	4.73 : 1.
Max. B.H.P. and speed..................................	287 B.H.P. at 1750 R.P.M.

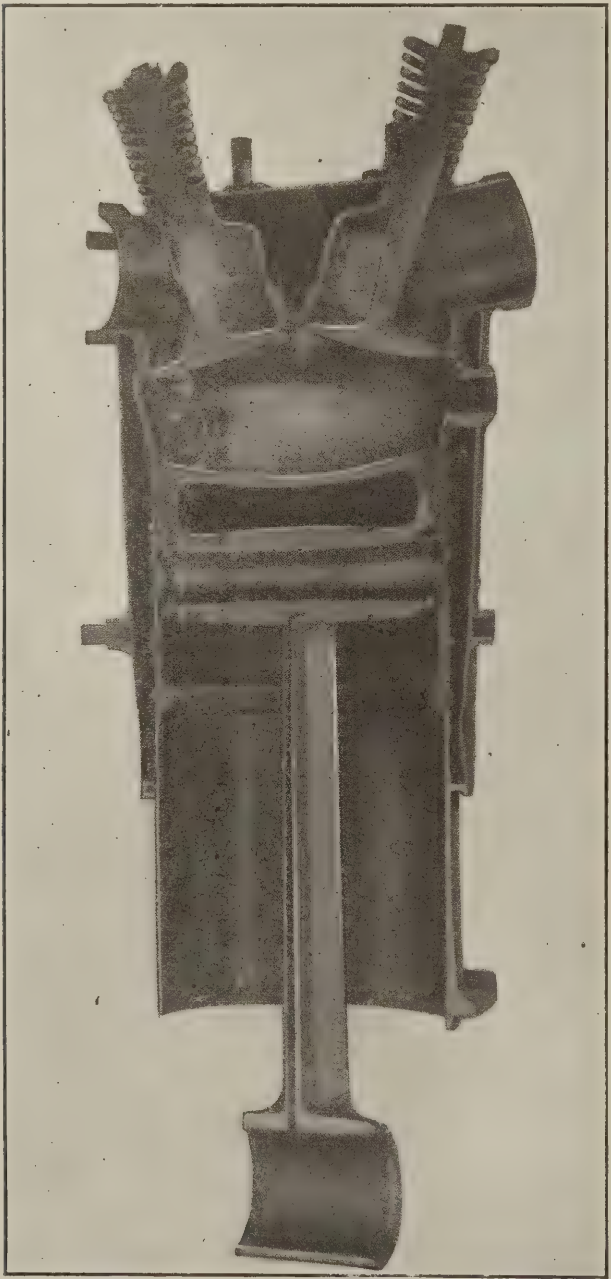


Fig. 4.—Sectional view of cylinder, piston, gudgeon pin, connecting rod, and valves, showing water jacket spaces and method of cooling exhaust valve stem

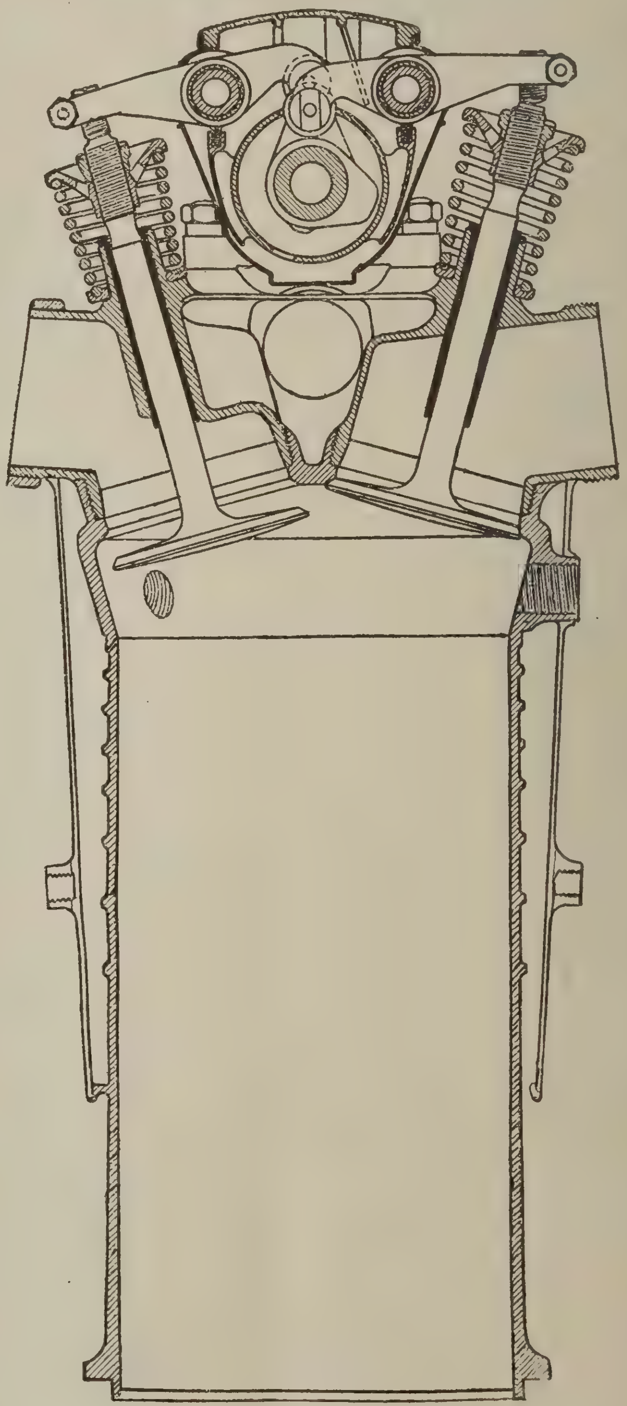
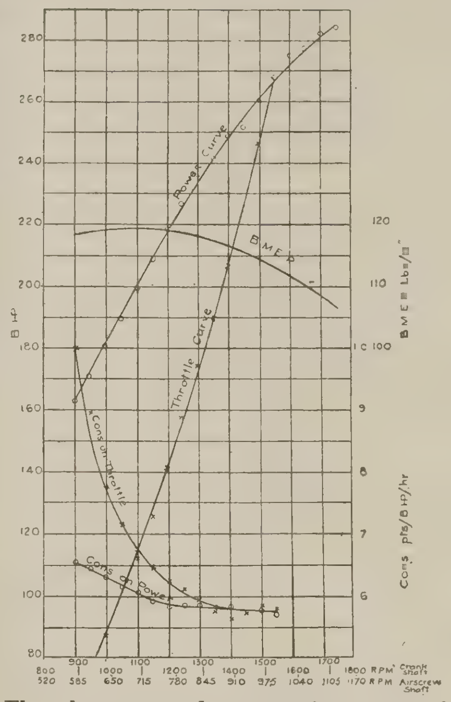


Fig. 5.—Section of cylinder and arrangement of overhead valve gear and cam-shaft casing

Normal B.H.P. and speed	242 B. H. P. at 1350 R. P. M.
Piston Speed at normal speed	1418 ft. per min.
Brake mean pressure at normal speed	118 lbs. sq. in.
Cu. ins. of stroke volume per B.H.P.	4.97 cu. ins.
Sq. in. of piston area per B.H.P.	0.788 sq. in.
B.H.P. per cu. ft. of stroke volume	348.0.
B.H.P. per sq. ft. of piston area	182.7.
Direction of rotation of crank	Anti-clockwise, facing airscrew.
Direction of rotation of airscrew	Left hand tractor.
Normal speed of airscrew	977 R.P.M.
Ration of crankshaft speed to airscrew speed	1.382 : 1.
Type of gear reduction to airscrew	Spur gear.
Lubrication system	Forced, multiple plunger pumps.
Oil temperature	37.5° Cent. (Test figures.)
Oil consumption per hour	10.16 pints = 11.43 lbs.
Oil consumption per B.H.P. hour	0.042 pint = 0.047 lb.
Specific gravity of oil	0.900.
Type of carbureters	Two Mercédes, twin-jet.
Diameter of chokes	0.945 in. = 24 mms.
Bore of main jets	0.078 in. = 2 mms.
Bore of pilot jets	0.0197 in. = 0.5 mms.
Fuel consumption per hour	141.3 pints = 127.1 lbs.
Fuel consumption per B.H.P. hour	0.582 pint = 0.524 lb.
Specific gravity of fuel	0.720.
Inside diameter of induction pipes	2.125 ins = 54 mms.
Type of magnetos	Two Bosch, H.L.8.
Firing sequence of engine	Airscrew. 1-3-2-4-8-6-7-5.
Speed of magnetos	Engine speed.
Magneto timing. (Degrees early, full advance)	30° early.
Inlet valve opens. Degrees on crank	2° late.
Inlet valve closes. Degrees on crank	51° late.
Diameter of inlet valve (smallest diam.) = d	2.677 ins. = 68 mms.
Lift of inlet valve = h	0.450 in. = 11.4 mms.
Area of inlet valve opening (π d h)	3.780 sq. ins. = 24.40 sq. cms.
Mean gas velocity through inlet valve at normal speed	149.5 ft. per sec.
Clearance of inlet tappet	0.012 in. = 0.305 mms.
Exhaust valve opens. Degrees on tank	52° early.
Exhaust valve closes. Degrees on crank	16.5° late.
Diameter of exhaust valve (smallest diam.) = d	2.677 in. = 68 mms.
Lift of exhaust valve = h	0.412 in. = 10.48 mms.
Area of exhaust valve opening (π d h)	3.460 sq. ins. = 22.4 sq. cms.
Clearance of exhaust tappet	0.018 in. = 0.457 mms.
Weight of engine complete, without water, fuel or oil, 900 lbs. (including exhaust manifold and airscrew hub)	
Weight per B.H.P.	900/242. 3.72 lbs. per B.H.P.
Weight of exhaust manifold	19.5 lbs.
Weight of oil carried in engine	17 pints = 19.13 lbs.
Weight of fuel per hour	127.1 lbs.
Weight of oil per hour	11.44 lbs.
Total weight of fuel and oil per hour	138.5 lbs.



Throttle power and consumption curves of the 240-h.p. Mercédès

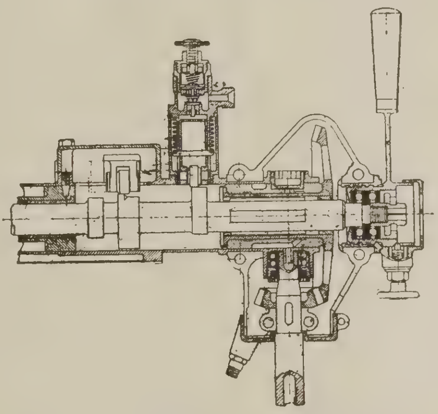


Fig. 18.—Arrangements of half-compression gear camshaft drive and details of air-pump

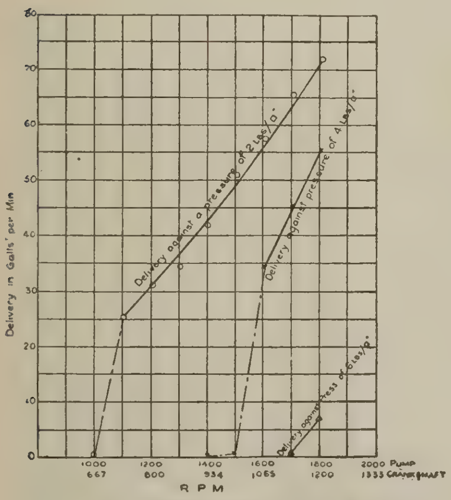


Fig. 20.—Water pump test diagram

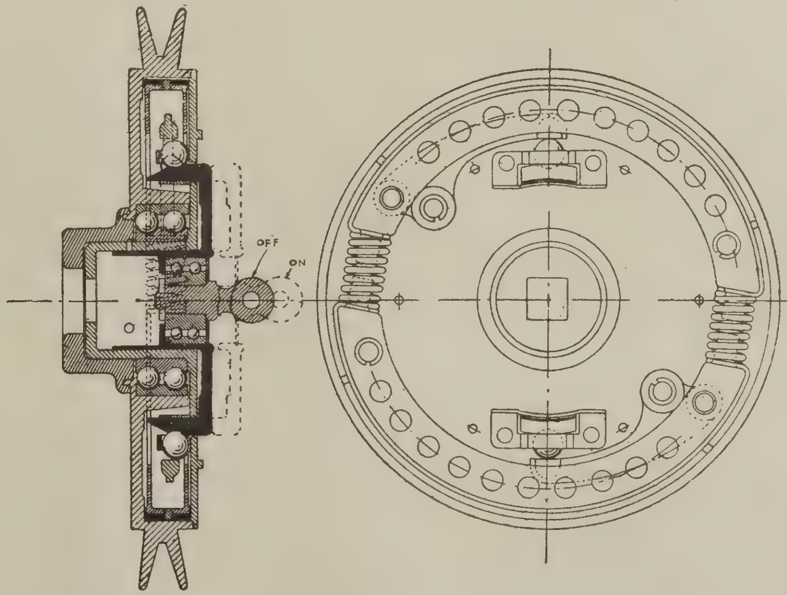
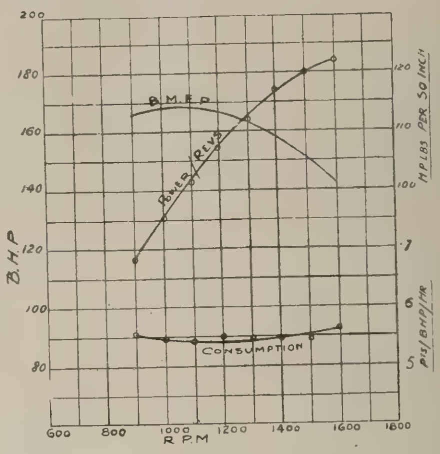


Fig. 16.—Sectional arrangement of wireless drive-clutch pulley

Gross weight of engine in running order, less fuel and oil.	1057 lbs. (Including cooling system, 242 × 0.65 lbs.
Weight per B.H.P.	1057/242. 4.37 lbs. per B.H.P.
Gross weight of engine in running order with fuel and oil for six hours	1971 lbs. (Tanks at 10% of weight of fuel and oil.)
Weight per B.H.P.	1971/242. 8.15 lbs per B.H.P.
Delivery of water pump at 1350 R.P.M. of engine	91 gallons per min.
Water jacket capacity of one cylinder	1280 cu. cms.
Ratio of water pump speed to crankshaft speed	1.5 : 1.
Water temperature. Inlet	65° Cent.
Water temperature. Outlet	78° Cent.
Diameter of water pump inlet and outlet	1.37 in. = 35 mms.



General Analysis of Weights

Description of Part	No. per set.	Average unit weight in lbs.	Weight of complete set in lbs.	Percentage of total weight
Description of Part	N per set.	Average unit weight in lbs.	Weight of complete set in lbs.	Percentage of total weight
Cylinders (Bare)	8	19.25	154.00	17.111
Pistons complete with rings and gudgeon pins.	8	6.85	54.80	6.088
Connecting Rods complete with floating bushes	8	5.00	40.00	4.444
Valves, Inlet and exhaust complete	16	1.312	20.992	2.332
Crankshaft, with floating bevel gear	1	94.50	94.50	10.500
Camshaft and case with half Compression gear	1	60.00	60.00	6.666
Reduction Gear (large) with airscrew shaft and bearings complete	1	45.00	45.00	5.000
Reduction driving gear on camshaft, complete with bearings and thrust race	1	23.25	23.25	2.583
Base Chamber (Top half)	1	103.75	103 75	11.527
Base Chamber (bottom half)	1	113.00	113 00	12.555
Carbureters, complete	2	8.00	16 00	1.777
Induction pipes, complete	2	7.25	14.50	1.611
Oil pump, complete	1	12.50	12.50	1 388
Water pump, complete		9.00	9.00	1.000
Vertical driving shaft, including magneto driving bevels and couplings, etc	1	12.50	12.50	1.430
Airscrew Hub complete	1	17.875	17.875	1.986
Magnetos	2	17.25	34.50	3.822
Ignition wiring complete	2	2.50	5.00	.555
Exhaust Manifold	1	19.5	19.5	2.166
Miscellaneous parts			48.958	5.439
Total weight of complete engine			900.00	100.000

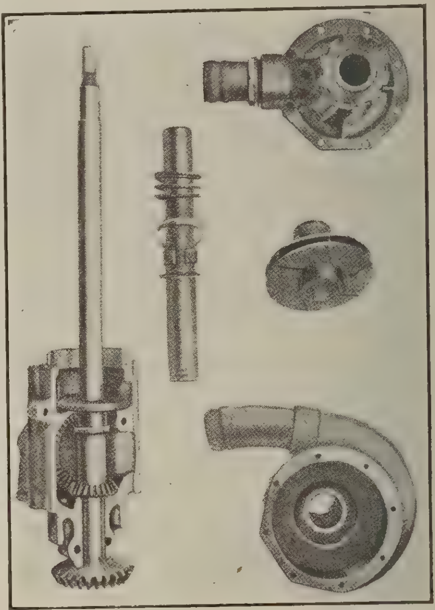
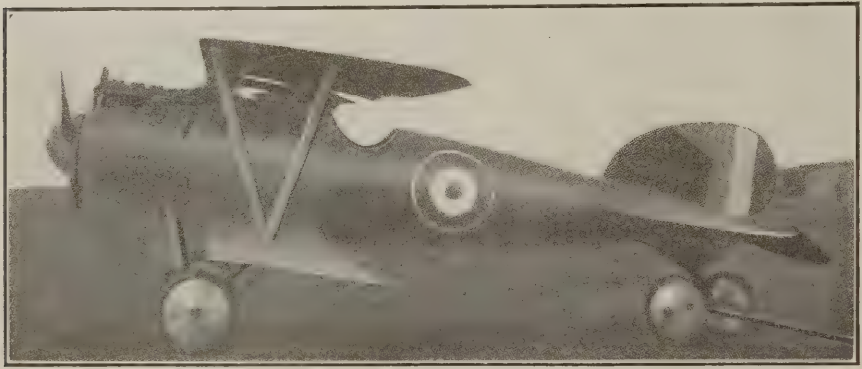


Fig. 15.—Water-pump and vertical shaft dismantled



The D. V. type Albatros Chaser from which the Mercédès engine illustrated in this article was taken

New British Bombers

"It is stated," says the *Daily Chronicle,* "that the Royal Air Force will soon have swarms of a new type of machine at the battle front, which is likely to add greatly to the difficulties of the Germans.

"This machine, a brilliant example of the constructor's art, is capable of carrying with its pilot and observer a great weight of bombs, machine guns and other equipment, to over 20,000 ft., and in an extraordinarily short time.

"Soaring, as the new machine will, above the average range of guns and German airmen, it can cross the fighting lines, drop its bombs, and return home swiftly for a new load. So fast is it, even at great altitudes, that long distances can be accomplished in the shortest periods, and bombing raids, which with the older type of machine would, perhaps, need a whole day's preparation, will now be carried out within a couple of hours. Moreover, what is of the utmost importance, their engines are completely reliable, and the risk that they might fail when a hundred miles over the enemy lines—a risk too common with some earlier types—no longer exists.

"It says much for their supreme value that, so far, not one of this type has been brought down, in spite of the Hun's utmost efforts. When the weather will not permit high flying, as is often the case in the winter, these machines will fly low, and so great is their speed that all but the fastest of modern scouts will be left behind them, as if standing still.

"For these machines the utmost skill and nerve are needed. The observer must not only be able to ward off hostile aircraft by accurate machine-gun fire, but he must also have an expert knowledge of map-reading and aerial navigation, since when flying long distances at great heights it is extremely difficult to find one's way by any landmark."

AN ALIGNMENT CHART FOR OBTAINING HEIGHTS FROM OBSERVATIONS OF PRESSURE AND TEMPERATURE

By A. H. STUART, B.S.C., F.R.A.S.

THE solution of Laplace's well known formula giving the relation between the height above datum level and the pressure and temperature of the atmosphere, may be rapidly accomplished by means of a d'Ocagne alignment chart, an example of which is shown in Fig. 1. Its use may be best explained by means of an example. Let the initial temperature (t_0) and pressure (p_0) be 20° C. and 29 inches of mercury, and at a certain height (z feet) suppose they have fallen to temperature (t) 0° C. and pressure (p) 20 inches. The ratio of the pressures $R = \frac{p_0}{p} = \frac{29}{20} = 1.45$, and the mean temperature $\frac{1}{2}(t_0 + t) = 10$. Place a straight edge across the chart so as to cut the right (R) scale at 1.45 and the left hand (T) scale at 10. The cut of the middle (z) scale gives the required altitude, namely, 10,000 feet.

Below is given a brief description of the principle and method of construction of the chart.

If three scales are arranged, as shown in Fig. 2, it is easy to prove that

$$Z = Z_0 + \frac{C}{A}X - \frac{B}{A}Y.$$

By using logarithmic scale d'Ocagne has made this fact of use in the solution of equations of the type $Z = \frac{KX^n}{Y^m}$.

For $\log. Z = \log. K + n \log. X - m \log. Y$, which is an equation of exactly similar form.*

If p_0 represent the pressure of air at a given point and p be the pressure at an altitude of **Z** feet above that point while the mean temperature over that range is T on the absolute scale, Laplace has shown that:—

$$\mathbf{Z} = 6.04 \times 10^4 \left(\frac{T}{273}\right) \log_{10} \frac{p_0}{p}$$

$$= 2.21 \times 10^2\, T \log_{10} \frac{p_0}{p}$$

Let the ratio $\frac{p_0}{p}$ be denoted by R.

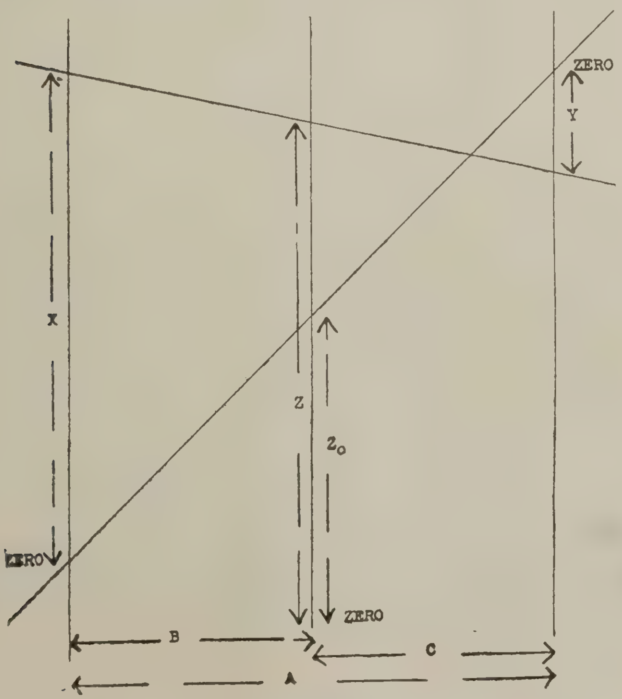


Figure 1

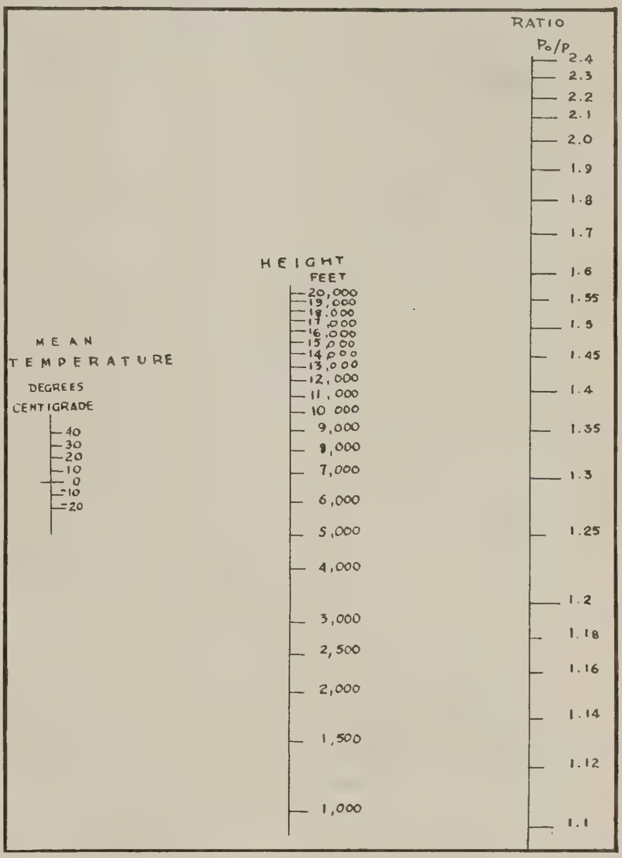


Figure 2

Then

$$\mathbf{Z} = 2.21 \times 10^2 \frac{T}{\dfrac{1}{\log. R}}$$

$$\therefore \log. \mathbf{Z} = \log. (2.21 \times 10^2) + \log. T - \log. \left(\frac{1}{\log. R}\right)$$

Compare this equation with $Z = Z_0 + \frac{C}{A}X - \frac{B}{A}Y$. It will be observed that $\frac{C}{A} = \frac{B}{A}$ and referring to Fig. 2 it will be seen that they they must necessarily be equal to ½, whereas their value should be unity. To counteract this effect the scales corresponding to X and Y (viz., T and R) must be drawn twice the size of that corresponding to Z (viz., **Z**). Table I. shows the calculation of the temperature scale.

TABLE I.

T.		log. T.	Difference.	Diff. × 2.
253	= −20°C.	2.4031	0	0
263	= −10°C.	2.4200	0.0169	0.034
273	= 0°C.	2.4362	0.0331	0.066
283	= 10°C.	2.4518	0.0487	0.097
293	= 20°C.	2.4669	0.0638	0.128
303	= 30°C.	2.4814	0.0783	0.157
313	= 40°C.	2.4955	0.0924	0.185

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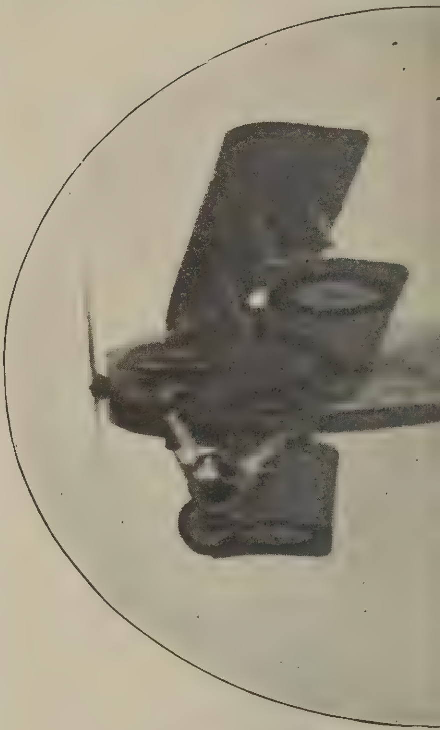
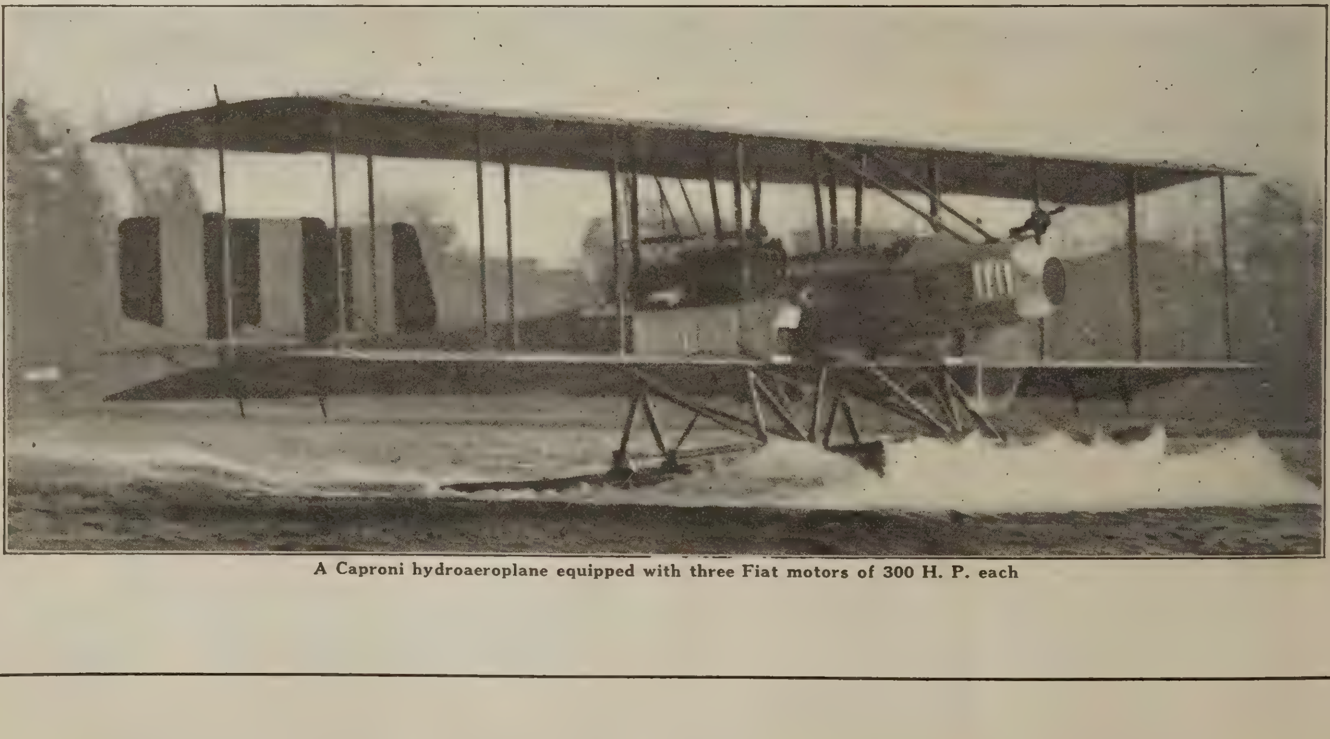
* Vide Traité de Monographie. Théorie des abaques. Applications pratiques. Paris, 1899.

DEVELOPMENTS OF INTE

Lieutenant Eytinge, Canadian Air Forces, conceived of the practical idea of having a mudscraper to scrape off the mud and eliminate the mud from the interior of the fuselage, which is apt to trouble the aviator while he is doing stunts

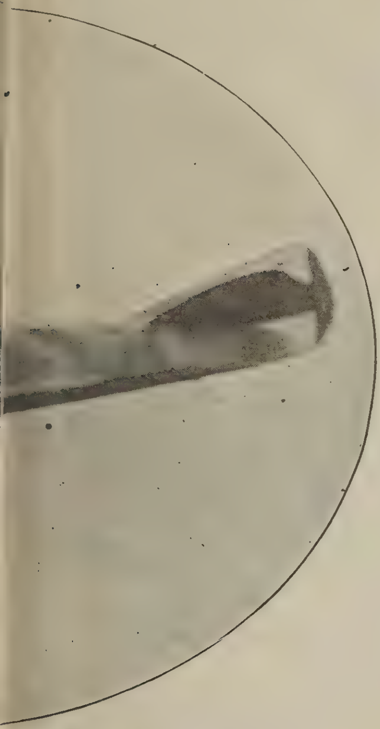


A French machine of the Escadrille S. P. A.
over th

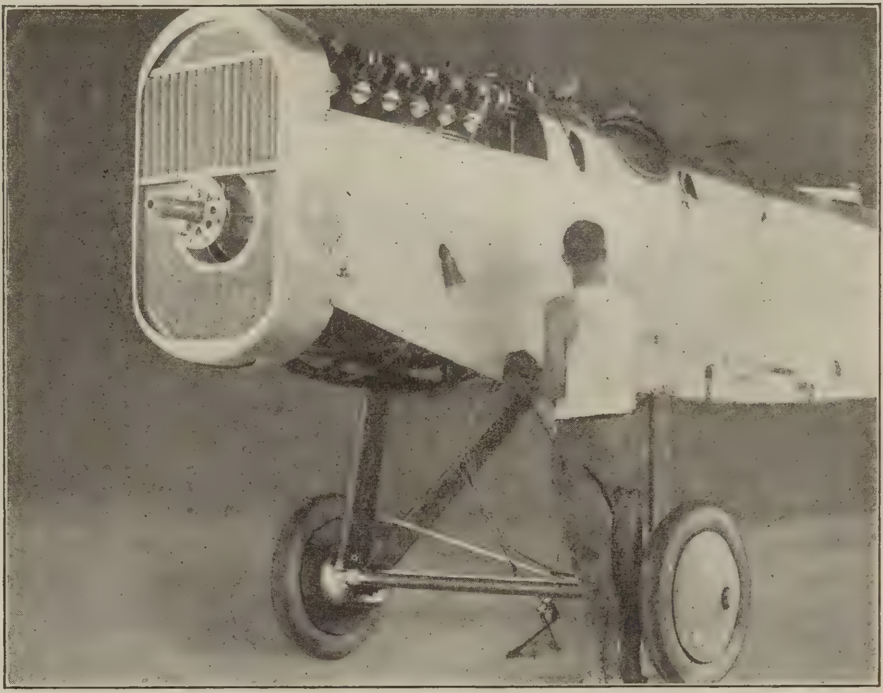


A Caproni hydroaeroplane equipped with three Fiat motors of 300 H. P. each

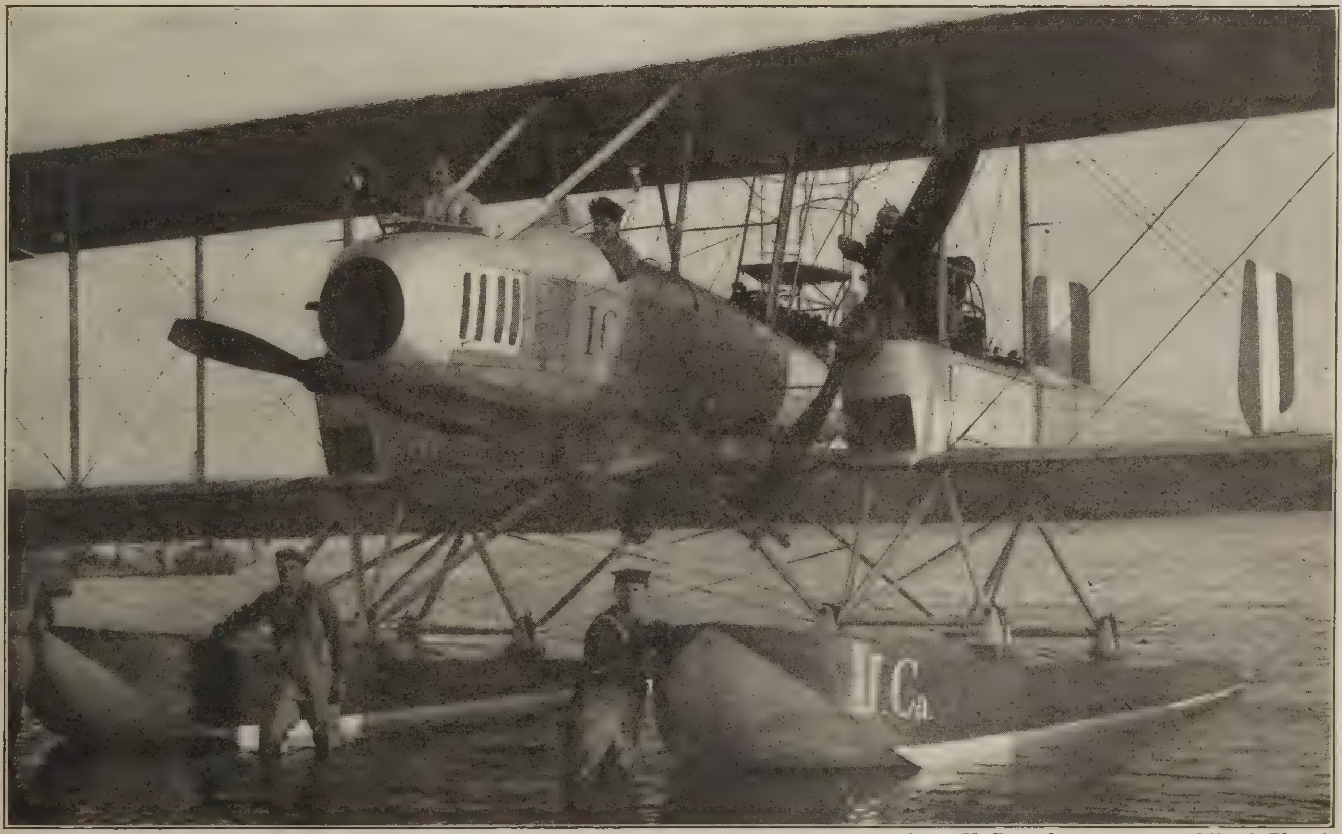
EST IN ALLIED COUNTRIES



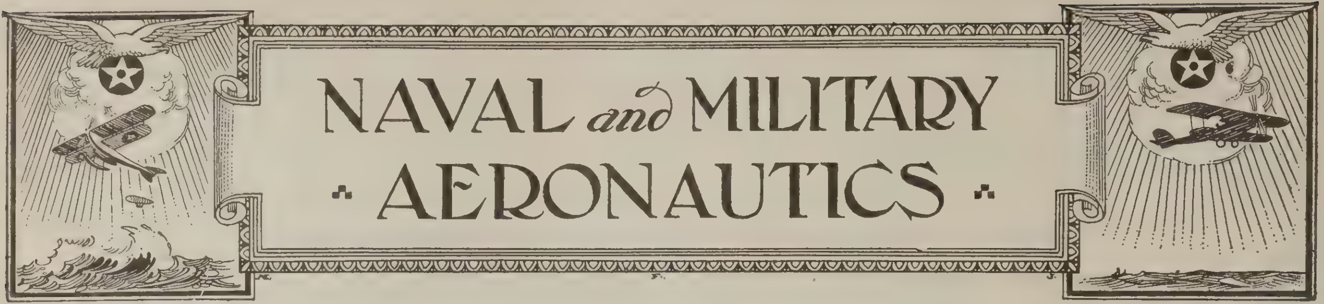
eturning to its aerodrome from a trip



An American made De Haviland 4 being assembled



A Caproni hydroaeroplane equipped with three Fiat A. 12 motors of 300 H. P. each (Official Photo)



NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Madison Barracks, Sackett Harbour, N. Y.
Note 3—Report to Chief, Technical section, Dayton, Ohio.
Note 4—Report to Elizabeth, N. J., as O. i/c Acceptance park. Wire DAP.
Note 5—Report to District Office, Production, N. Y. C. Wire DAP.
Note 6—Report to 480 Lexington Ave., N. Y. C., Dis. Mgr. Production.
Note 7—Report to 480 Lexington Ave., N. Y. C., Capt. M. H. Grace.
Note 8—Report to 480 Lexington Ave., N. Y. C., Dis. Mgr. Finance.
Note 9—Report to Dis. Mgr. Production, Chicago, Ill.
Note 10—Report to Capt. P. B. Holmes, 870 Woodward Ave., Detroit, Mich.
Note 11—Report to Aviation Gen. Supply depot, Middletown, Pa.
Note 12—Report to Dis. Mgr. Finance, 2050 Elmwood Ave., Buffalo, N. Y.
Note 13—Report to Capt. J. N. Patterson, San Francisco, Cal.
Note 14—Report to District Approvals Office, 480 Lexington Ave., N. Y. C.

Special Orders Nos. 184-189, Inc.

A

Alvey, Aloysius B.	SMM
Aikman, Claude E.	SMM
Ayers, George William	SLA; CGC
Averill, Howard Burton	SLA; GLC
Aaron, David Jones	SLA; CGC
Adams, Marshall Cranworth	SLA; GLC
Austin, Charles Allphin	SLA; GLC
Allison, Irving B.	FRF
Ayling, John G.	FRF
Abrams, David Harry	SLA; GLC
Armentrout, Dale M.	SLA; KST
Austin, Carter Harrison	SLA; CWT
Allen, George E.	FRF
Auten, Harry Willbert	SLA; AAD
Apgar, Edward Percy	SLA; DAP
Anderson, Edwin F.	TFT
Abernathy, James Thomas	SLA; PMT
Atwater, Donald Vince	SLA; ELA
Allred, Frank Ewing	SLA; TFT
Andrews, Clarence E.	LHV
Andrews, Edwin Lee	SLA Note 2

B

Beisel, Harold Newkirk	SLA; RSD
Boulware, Clark Lewis	SLA; GLC
Bertschi, Phil A.	WFO
Bonnell, Harry M.	WFO
Briney, Wilton M.	WFO
Burton, Charles H.	WFO
Blumhardt, Charles	SLA; VBW
Barker, John DeForest	SLA; CWT
Benjamin, Hamilton F.	HHN
Barrett, James Taylor	SLA; RSD
Bradley, Addison B.	DMA
Bailey, Augustus O.	WFO
Beckford, George F.	WFO
Baer, Charles F.	PFO
Burke, William J.	BST
Broman, Victor	SLA; HHN
Boone, Ralph R.	WFO
Brunner, Frank Joseph	SLA; SBI
Blanchard, Ernest Malcolm	SLA; GLC
Barnes, Herbert Tracy	SLA; AAD
Bradford, John Richard	SLA; LDT
Bliss, Charles Allen	SLA; CAF
Burnet, Gilbert W.	FRF
Burrows, Frank H.	FRF
Brown, John James	SLA; TFT
Banigan, John Joseph	SLA; CWT
Bowden, William McEchron	SLA; AAD
Burns, David Brantley	SLA; GLC
Bowen, Robert Hall	SLA; HHN
Blake, Frederick H.	EOT
Boyce, Cyril	EOT
Becker, Albert E., Jr.	WFO
Benton, John W.	GLC
Burton, Frederick Holder	SLA; BFT
Burks, Edward Raymond	SLA; CJW
Buffington, James, Jr.	SLA; KST
Billman, Elliott	SLA; DAF
Bone, Norfleet G.	SLA; AAD
Benstead, Horace M.	FLA
Beverley, George Hendricks	SLA; AAD
Berry, Thornton Archibald	SLA; KST
Beery, Levi L.	SLA; CWT
Bosler, Barrett Kumler	SLA; KST
Bubert, Raymond Herman	SLA; EOT
Benson, Joseph Williams	SLA; CJW
Bayard, George Reilly	SLA; DMA
Bowman, Charles E.	LHV
Boyd, William L.	WFO
Boyce, John S.	DAP
Barrett, George B.	HHN
Bizzozero, Angelo Peter	SLA; CJW
Baker, Joseph	SLA; VBW
Braasch, Benjamin Arnold	SLA; CJW
Blois, Marsdon Scott	SLA; CJW
Berry, Leroy Nahum	SLA; CJW
Boushall, Joseph Dozier, Jr.	SLA; ELA
Byrne, Walter Alfred	SLA; AAD
Bunce, Ralph L.	FRF
Bretting, William H.	CRI

Benton, Herbert George..............SLA; KST
Blair, Elmer Walling................SLA; BFT
Bush, Charles Amos.............SLA; Note 13
Brown, William C. F...................Note 3
Bane, Thurman H.......................Note 3
Bourne, Granville Harman........SLA; Note 8

C

Conner, William F.........................CGC
Crueckshank, Bruce Davies.........SLA; PMT
Chetlain, Frederick H....................WFO
Cook, Dean C..............................WFO
Collier, Ralph P..........................LDT
Clark, Arthur F...........................FRF
Clark, Horace.............................FRF
Card, George B............................WFO
Clarke, William B.........................WFO
Crank, James Harold...........SLA; PMT
Calvin, James Michael.............SLA; RSD
Coles, Barry F............................WFO
Cramer, Parker Dresser...........SLA; PMT
Chamberlain, Clarence D...................WFO
Coffee, John A............................WFO
Cornish, Clarence Franklin........SLA; AAD
Coleman, John C. M........................WFO
Clowes, Randolph..................SLA; PMT
Cushman, Stewart Allerton.........SLA; HHN
Cummings, John H..................SLA; CGC
Cheese, Charles Bristow...........SLA; KST
Cheesman, Roy Walling.............SLA; LHV
Crawley, Edward Herbert...........SLA; SBI
Connell, Samuel M.........................HHN
Crissey, Sherman B........................WFO
Corkville, John D.................SLA; AAD
Claiborne, Harry Cleo.............SLA; AAD
Clark, Hobart.....................SLA; CWT
Chamberlain, Rowland L....................DMA
Carrow, Arthur Maurice............SLA; DAP
Coe, Theodore Lawrence............SLA; CRI
Clouse, Oles Ivan.................SLA; GLC
Cameron, Eugene Arthur............SLA; GLC
Couch, Howard Hunt................SLA; RSD
Crossan, Carroll Barker...........SLA; KST
Coffyn, Frank T...........................HHN
Calhoun, Hugh Lucian..............SLA; SBI
Cary, Malcolm C...........................PWM
Crow, Homer L.............................WFO
Cochrane, Earl C..........................LDT
Cole, James Bartow................SLA; SBI
Coleman, James Bruce..............SLA; SRC
Clearwater, William Mould.........SLA; DMA
Coates, Aaron T...........................FRF
Clayton, Albert J.........................DMA
Clark, Ray Henry..................SLA; RSD
Cundiff, Lawrence Bayard..........SLA; APR
Crooks, William Raymond...........SLA; KST
Cornog, Clyde Isaac...............SLA; APR
Campbell, Allan...........................DMA
Carter, Jewell L..........................FOB
Cole, Frank Winslow...............SLA; CJW
Cairns, Clifford Albert...........SLA; CJW
Carolan, George Francis...........SLA; GLC
Case, Kenneth Beardsley...........SLA; CJW
Carples, Edmond N.........................SLA
Carples, Bernard John Ross........SLA; TFT
Cain, Howard Benton...............SLA; TFT
Campbell, Mark....................SLA; KST
Cooley, Arthur Burton.............SLA; CWT
Campbell, Robert Victor...........SLA; KST
Crueger, Herman C.....................Note 11
Clark, Virginius E.....................Note 3
Carpenter, Charles Irving........SLA; Note 6

D

Durand, Eugene....................SLA; CFT
Dando, Joseph Clifford....................LHV
Davis, Guy Hammett................SLA; HHN
Dorwart, Frederick G......................BST
Day, Curtiss L............................BST
Davis, Kenneth William............SLA; SBI
Davidson, Robert Mowbray..........SLA; DAF
Dougherty, William Aldrew.........SLA; PMT
Davis, Elmer C., Jr.......................BST
Davis, Kenneth M..........................BST
Drake, George H...........................BST
Dolan, Julius Charles.............SLA; CWT
Dooley, Peyton Y..........................WFO
DeVore, Ralph R...........................BST
Davis, Don Phelps.................SLA; CRI
DeGarmo, Elmer Coleman............SLA; TFT
Donoho, Murray T..........................HHN
Duke, Llewellyn Brittain..........SLA; AAD
Durst, Elmer Frederick............SLA; SBI
Deane, Frederick James............SLA; CAF
Davey, Everett Kelsey.............SLA; SBI
Day, Robert Francis...............SLA; BFT
DeLin, Martin.....................SLA; CAF
Deadman, William Webster..........SLA; TFT
Dawson, Joseph Chester............SLA; TFT
Dickey, Robert William............SLA; DAP
Doherty, Julian Benedict..........SLA; TFT
Day, Frederick S..........................FRF
Dillon, John Allen..............SLA; Note 14

E

Emerson, Sigard A.........................EOT
Edwards, Lewis Taylor.............SLA; PMT
Embleton, Robert David Vore.......SLA; CWT
Epler, Earl Norbury...............SLA; KST
Evans, Arthur H...........................WFO
Eckstrom, Lawrence J......................GLC
Eddy, Allyn M.............................FLA
Ernst, Hilmar F...........................WFO
Eilenberger, John T.......................WFO
Eaton, Charles F..........................BST
Entwistle, David Gillespie........SLA; CJW
English, Frank James......................GLC
Eyrich, Harold R..........................DMA
Ely, Newell Driggs................SLA; KST
Ehrlichman, Rudolph Irwin.........SLA; RSD
Evans, Roy.......................SLA; Note 2

F

Foster, Daniel Weir...............SLA; CGC
Folsom, Harold J..........................WFO
Foster, Ralph F...........................WFO
Flannery, James...................SLA; KST
Fitzgerald, Freeman C.....................BST
French, Irvine....................SLA; CWT
Fergus, Ernest Leroy..............SLA; CGC
Friedlander, Harold Hess..........SLA; CWT
Fogg, Robert Stevens..............SLA; KST
Feireisel, Charles H..............SLA; VBW
Foster, Edwin B...........................WFO
Foster, Thad V............................WFO
Faxon, Warren E...........................FRF
French, Samuel L..........................GLC
French, Seth Thomas...............SLA; CWT
Fulmer, Raymond Lawson............SLA; CJW
Fay, Wallace Macfie...............SLA; DAF
Finley, David Edward, Jr..........SLA; DAP
Furnald, Stanley Marcus...........SLA; APR
Fox, Louis Rodman.................SLA; DAP
Fehlman, Leo George...............SLA; DAF
French, Donald Andrew.............SLA; KST
Fenwock, Herbert F........................DIK
Fife, John Albert.........................CAF
Fladeland, John E.........................WFO

G

Gilfillan, William Emmett..........SLA; DAF
Gilbert, Francis McKinnley........SLA; RSD
Goembel, William Phillip..........SLA; CWT
Glennon, Herbert Lawrence.........SLA; AAD
Gardner, William A........................BST
Gibson, Julius R..........................EOT
Graham, Garrett H.........................EOT
Goodwin, Harold C.........................FRF
Gillern, Maurice F........................FRF
Gore, Frank De Witt...............SLA; CFT
Gardner, Kelsey Beeler............SLA; APR
Goetz, Charles G..................SLA; VBW
Geier, Philip Elmore..............SLA; AAD
Gledhill, Franklin Wright.........SLA; PMT
Gallagher, Thomas J.......................UTA
Goss, Edgar Keith.................SLA; KST
Glackman, William G.......................BST
Gilkeson, Adlai H.........................CRI
Gribble, Frederick Charles........SLA; CJW
Gillelen, Warren P........................DMA
Griffin, Courtlandt Brooke........SLA; FLA

H

Haldeman, Ward F..........................EOT
Harvey, John R............................EOT
Holmberg, Gustave A.......................EOT
Harding, Roland Ralph.............SLA; CWT
Hunt, Spencer S...........................HHN
Henley, William Carlton...........SLA; CGC
Hebbard, Charles B........................FRF
Hesse, Otto Adolph................SLA; GLC
Hird, John Donald.................SLA; PMT
Hickman, James Burr...............SLA; TFT
Hollis, Henry F., Jr..............SLA; AAD
Horsley, Robert Sankey............SLA; SBI
Haines, Russell Sage..............SLA; GLC
Hubbard, Lyle.....................SLA; RSD
Halsey, Edward S..................CPA; DMA
Harvey, Francis S.........................BFT
Hickman, Cecil R..........................WFO
Horton, Russell B.........................WFO
Hoover, Louis.....................SLA; ELA
Haag, Francis E...........................MJA
Heald, Robert S...........................FRF
Haskins, George W.........................GLC
Heltzen, William S........................GLC
Hollingsworth, John Y.....................GLC
Haggerty, Lyman H.........................WFO
Harmon, Jack..............................BST
Hill, Charles.....................SLA; AAD
Hart, William C...........................EOT
Hitchcock, William C......................WFO
Holenshade, Daniel M......................WFO
Hayward, Malcolm M........................CPA
Hadley, Lawrence B........................WFO
Harrison, George H........................WFO
Henderson, Edmund M.......................BST
Hayes, Benjamin Hubert............SLA; DAF
Hoadley, Herbert Eugene...........SLA; CJW
Handley, Louis Paul...............SLA; LDT
Huston, Paul Waite................SLA; PMT
Harwood, Robert Walker............SLA; SBI
Hall, Wilmer Eugene...............SLA; KST
Hickman, George Butler............SLA; CJW
Hazeltine, Richard Gibson.........SLA; CRI
Hutton, George Wilson.............FLA; VBW
Hine, Harold Kirkham..............SLA; CJW
Horton, William Ogden.............SLA; RSD
Havekorst, Walter Benedict........SLA; RSD
Hill, Lon C...............................RSD
Harley, Wilbur Herbert............SLA; DAF
Hamrick, Roy Hall.................SLA; SBI
Haynes, Winthrop Perrin...........SLA; APR
Hoffman, William W........................FRF
Horrigan, Thomas Francis..........SLA; CWT
Hansen, George W..........................PFO
Harwell, Ervin Lunsford...........SLA; DAF
Hough, Walter Bernard.....................CAF
Hamill, Howard E..........................WFO
Holt, Harry C.............................DIK
Hodge, Robert Ray.................SLA; BFT
House, Edwin J............................CPA
Hart, Harry N.............................CGC
Hults, Eugene Arthur......................CPA
Hutchins, Benjamin B..................Note 11

An American seaplane on U-boat patrol

Hardy, Arthur Cobb..............SLA; Note 2
Hazelton, Harry..................SLA; Note 2
Holt, Joseph Franklin............SLA; Note 10
Hinds, Norman Ethan............SLA; Note 2

I

Isaacs, Charles Woolworth..........SLA; RSD
Ingels, Giltner Russell..............SLA; CRI

J

Johnson, Myron Abner Cameron...SLA; MAC
Jones, Marvyn McCormick..........SLA; EOT
Jones, Ernest Earl..................SLA; DAF
Jones, Richard Hugh...............SLA; SBI
Janes, Charles Raymond............SLA; CFT
Johnson, Herbert Carl.............SLA; SBI
Johann, Orville Roy..............SLA; CWT
Jones, Lloyd B.........................BST
Jansen, Stanley William.................SLA
Jackson, John Warner....................CAF
Johnson, Arthur Edwin.............SLA; TFT
Johnson, Edwin....................SLA; BFT
Jacobs, Lynwood B......................RSD

K

King, Harry C..........................HHN
Kruse, Alfred Rudolph.............SLA; CGC
Kmiecinski, Paul C................SLA; VBW
Kern, John Tate...................SLA; RSD
Kidwell, James Emmet..............SLA; CRI
Krege, Henry Ludwig Flood........SLA; HHN
Keyes, Charles S.......................WFO
Kesler, Gerald L.......................WFO
Koch, Albert M.........................WFO
Keith, William S.......................WFO
Klingman, Earl J.......................WFO
King, Lawrence S.......................PWM
Kuehl, Adolph A........................PWM
Kratky, Alfred H.......................WFO
Kelley, Virgil A.......................LDT
Keyser, Milton E.......................FRF
Knott, James Edward, Jr...........SLA; PMT
Krum, Howard Everett..............SLA; AAD
Kirby, Marquis Lafayette...........SLA; CWT
Kirkland, Samuel N.....................WFO
King, Philip Henry................SLA; TFT
Kruss, Edmund A........................DMA
Kellog, Rossiter Henry............FLA; DAP
Keith, William Scott..............SLA; TFT
Kiener, Harry..........................EOT
Keller, Reuben Wallace............SLA; AAD
Kraft, Lester Lee.................SLA; CRI
Klingaman, Earl J.................SLA; CWT
Kenworthy, Chester L...................KST
Kenny, Ransom Dudley..............SLA; BFT
Keller, Dallas Clifford................CAF
Kirkby, Kent S.........................CRI
Keyser, Milton Elstner............SLA; CJW
King, Walter W......................Note 3

L

LaMonte, Edwin Bolton.............SLA; PMT
Lawler, Victor Francis............SLA; RSD
Lutz, Dexter Nathaniel............SLA; SBI
Leeburn, Leo Joseph...............SLA; ELA
Lemley, Russell W......................PWM
Lyle, Homer E..........................PWM
Lawler, Victor F.......................WFO
Linman, Luke E.........................WFO
Longgood, Eugene Adolph...........SLA; SBI
Lippitt, William Fontaine, Jr..........SMM
Levitt, Glenn Seney...............SLA; CWT
Lenderking, Louis T., Jr...............WFO
Lohman, Sylvester M....................WFO
Luce, Robert Francis..............SLA; HHN
Looram, Lucien A.......................WFO
Lamoreaux, Lowell Pennell.........SLA; GLC
Laventhal, Ruby...................SLA; CRI
Lulow, Roy Verl...................SLA; KST
Lockhorn, Clifford Joseph.........SLA; PMT
Lyman, Richard S.......................MAT
Ledbury, Francis Herbert..........SLA; TFT
Lewis, Charles W.......................CGC
Lum, Robert Elliott...............SLA; CJW
Lintz, Roy Peter..................SLA; RSD
Lawson, Dudley Bridgeman..........SLA; TFT
Lutz, Clovis Charles..............SLA; BFT
Lederer, Lewis George.............SLA; APR
Leche, Eric Daniel................SLA; BFT
Lewis, Harold M........................FRF
Lowe, Larone...........................PWM
Lewis, Lloyd N.........................PFO
Loeb, Sidney Arthur....................FLA
Libbey, Henry Alexander..........SLA; Note 7
Lilley, Leonard E...................Note 3
Lassiter, Robert E..................Note 4

M

Matthews, Thomas Kennedy..........SLA; RSD
Mann, Adolph H.........................EOT
Miller, George E.......................EOT
Miner, Vern E..........................EOT
Merrill, George Parker, Jr........SLA; ELA
Marsh, Ian Dawson.................SLA; SBI
Mason, Edward J........................WFO
Moon, Harold F.........................WFO
Mustard, Stanley P.....................WFO
Mann, Asa Collis..................SLA; AAD
Madden, William D.................SLA; VBW
Miller, George W.......................LDT
Morfa, Raymond J..................SLA; AAD
Marincik, Joseph A.....................GLC
Morrow, George D.......................GLC
Marberry, Jason Maurice...........SLA; CAF
Murphy, Joseph Aloysius...........SLA; RSD
Massingill, Martin Luther.........SLA; TFT
Midkiff, Robert F......................LDT
Moon, Odas.............................LDT
Moran, John L..........................LDT
Moore, Joe John...................SLA; KST
Murray, Kenneth Malcolm...........SLA; SBI
Miller, Royall McIntosh...........SLA; BFT
Moen, George Melton...............SLA; GLC
Moon, Harold F....................SLA; TFT
Miller, Charley........................WFO
Miller, Felix Bernard.............SLA; CFT
Martin, Joseph H.......................PWM
Marsden, Ross S........................PWM
Miller, Raymond H......................PWM
Mayer, Frederick John.............SLA; PMT
Miller, Frank Richard.............SLA; GLC
Morris, Glenn De Witt.............SLA; TFT
Morrissey, John Francis...........SLA; ELA
Marshall, Fred Leroy..............SLA; TFT
Momand, Don Stuart................SLA; HHN
Muirhead, Brian Robert............SLA; RSD
Morrow, William McKinley..........SLA; RSD
Martin, Charles Daniel............SLA; CJW
Maxey, John Wesley................SLA; BFT
Maune, Leonard August.............SLA; CWT
Merrill, Cedric Valentine.........SLA; AAD
Micander, Herbert Chester.........SLA; CAF
Maynes, Francis J......................FLA
Munsell, William Percy............SLA; CFT
Matthews, Thomas Clark............SLA; FOB
Morris, John E.........................MAT
Massey, Ivor......................SLA; PMT
Momand, Don Stewart....................FRF
Markle, Alvan, Jr......................FLA
Miller, Daniel Wallace............SLA; BFT
Morgan, Fred M.........................PFO
Minter, Clarke C....................Note 3
Moore, Ambose Clark..............MJA; Note 5
Mabey, Herbert Stanly............SLA; Note 5

Mc

MacKenzie, Clifford R..................EOT
MacNeil, Ralph Langdell...........SLA; CGC
McBride, William W.....................EOT
McKay, Harold A........................EOT
McVay, George Edward..............SLA; PMT
McArn, Theodore Archibald.........SLA; DAF
McClellan, Albert L....................EOT
McCaffrey, Harry Frank............SLA; RWT
McBride, Clarence Earl............SLA; PMT
McGraw, Will Curtiss..............SLA; PMT
McGinnis, Harold Alling...........SLA; SBI
McGinn, John T.........................PFO
McGaughy, Franklin C...................SMM
McCullough, Howard J...................FRF
McArn, Hugh Monroe.....................SMM
McPhail, Robert Gibbard................SMM
McNally, Sellers McKee............SLA; TFT
McMillin, Frank E., Jr.................WFO
McChord, William C.....................PMT
McCluer, Charles Forrer...........SLA; KST
McKenzie, Arthur George...........SLA; CJW
McBane, Frederick William.........SLA; KST
McRaith, Joseph Gregory...........SLA; BFT
McCue, John B..........................LHV
McGinn, John Thomas...............SLA; CJW
McGlone, John Philip..............SLA; TFT
McDonnell, John Michael..........SLA; Note 2
McLaurin, King H....................Note 3

N

Norlin, Charles E......................DAP
Neegli, Fred A....................SLA; CGC
Nicely, George Manning............SLA; GLC
Nagle, Clarence D......................FRF
Nally, Luke J.....................SLA; VBW
Nigh, Gordon K.........................MAT
Nelson, John Heisler..............SLA; CAF
Nelson, Francis Oscar.............SLA; ELA
Napier, Charles Hamilton..........SLA; CJW
Netcher, Charles.......................ARV

O

O'Brien, Raymond H.....................WFO
O'Shea, Edward M.......................WFO
O'Hearn, Francis Maurice..........SLA; AAD
Overholt, George T.....................WFO
Owens, Celeste Frank..............SLA; KST
O'Connor, John Martin.............SLA; CJW
Olds, Carlton T...................SLA; CJW
Osborn, Byrle, Jacob..............SLA; CRI
O'Connor, William J....................HHN
Oakley, Edward H.......................UTA
Oertel, Robert C.......................WFO

P

Pennebaker, Charles Thomas........SLA; TFT
Poland, Ross Edwin................SLA; SBI
Poole, Harold W........................FRF
Pike, Vernon B.........................LDT
Peterson, Frank L......................WFO
Preble, Robert C.......................WFO
Polhemus, Josiah A.....................SRC
Polk, Claude A.........................WFO
Pickering, Maylin J....................CGC
Platz, Edward Henry, Jr...........SLA; CRI
Park, Bartholow...................SLA; RSD
Pollard, Fred Don, Jr.............SLA; PMT
Peabody, Dwight Vandorn...........SLA; TFT
Palmer, Charles H......................BST
Parsons, Frederick C...................WFO
Price, Griswold Andrews...........SLA; GLC
Pickett, Roy W.........................WFO
Parker, Albert N.......................FRF
Phillimore, Walter N., Jr..............PWM
Pratt, Herbert G.......................WFO
Palmer, Wendell Heaton.................SMM
Prussian, Aaron...................SLA; DAP
Pelich, Joseph Roman..............SLA; CRI
Parker, Harold....................SLA; BFT
Perkins, Albert Dashiell, Jr......SLA; BFT

(Continued on page 1288)

A view of Bolling Field, near Washington, D. C.

(*Continued from page* 1262)

Royal Air Force, there is the keenest appreciation of, and anticipation for, the signal success of the American air services.

The general opinion is that this war will last from one to two years or even longer. My opinion is that if this war is to be won, or even if it is to be limited to any definite length of time, it will be won only through the air.

The United States must speed up its building of aeroplanes. It must double the present rate of output and must be ready to increase its carrying facilities until it will be possible for machines to reach Berlin with large cargoes of explosives. The policy of using kid gloves with Germany, allowing her to go on murdering our women and children, must be brought to an end, and aeroplanes will do it.

The Germans who, through expert propaganda, still believe that the Kaiser and his hordes are winning the war, must be made to understand that they are rapidly losing it. The fear of God must be instilled into them and this can only be done through dropping tons of bombs on Berlin. Not periodically, but every hour of the day until there is nothing left but a pile of smoldering ruins. Berlin must be made to look like what I have seen—and thousands others—of the cities of Amiens, Arras, and countless more.

On aircraft production England is working rapidly and all her best efforts are being directed to that end. But the English output is not one-tenth of what is required, notwithstanding the fact that almost every English girl of 17 years or over is engaged in war work.

It is up to the United States to increase her production of aeroplanes in the same ratio she has increased her building of ships. Let her output be quadrupled in two months and then quadrupled again and again until there are thousands of planes leaving their bases every morning for Berlin on their mission of punishment.

I found that the Americans who are in France have but one determination—no peace except it were made in Berlin, and God knows those boys over there are going to be steadfast in their resolution. To gain their object over the land routes will be a slow process, and to get to Berlin will require a heavy toll of human sacrifice. Why make it? The Huns are not worth it. Do it through the air. The sacrifice will then be small in comparison. The United States has the power, the money, the material, and, better than all, the young men, filled with grit and courage, to man the aeroplanes.

Too much effort, comparatively, has been devoted to all the other forces of war, instead of concentrating to a great degree on the air force, which I am certain is the only one for a prompt and thorough termination of this war.

Our airmen are keen for the job of bombing Berlin, and I think it should be a squadron of American airmen who should have the distinctive honor as recompense for the magnificent work they already have done.

The groundwork is being perfected for American air work on a grand scale in the near future. There are large "Production Departments," as they are called—really, assembling and testing departments—and several flying schools of huge proportions, as well as repair shops, supply centers, etc., all on the same big scale. Already there are men here in plenty to fill all these, and as soon as the engines and parts and necessary materials begin to arrive in volume—as they will do shortly—it will not take long for the original program to materialize.

I inspected several of these new flying schools, saw a great deal of expert flying quite up to the standard of the best French and British work, and flew myself with several of the American boys, feeling quite secure in their hands as they indulged in "banking," spirals and "low work," which consisted of skimming the fields at ninety miles an hour, jumping fences, hedges, trees and houses with the utmost perfection of control. I am convinced that these American boys will rank among the best fliers in combat work at the front. On a recent Sunday morning, at one of the flying centers I visited, there were perhaps sixty machines in the air at once, some practising in formation, some doing ordinary "stunts," some advanced acrobatics and others hard at "combat work," which consists of darting upward, tumbling downward, falling sideways and apparently quite defying all the known laws of gravitation in the supreme and constant effort to keep "on the other fellow's tail."

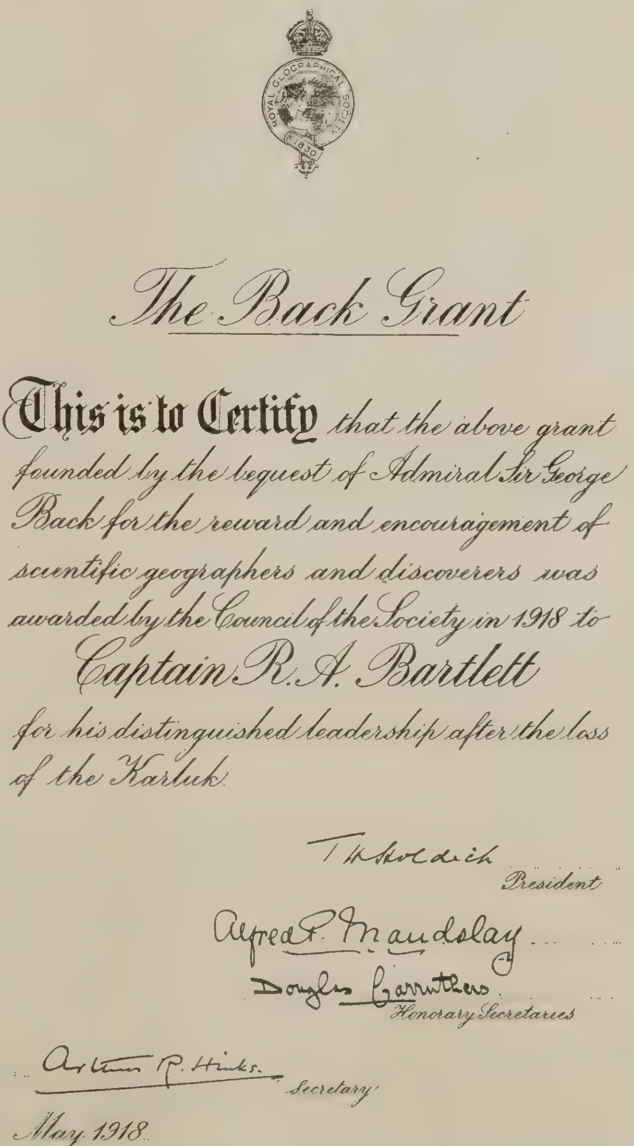
This flying center is in a fine level stretch of country, both open fields and woodlands, divided into eight distinct flying fields. Fields 1, 2, 3 and 4 are grouped together, with living quarters adjacent for all the pupils who are being drilled in the first four stages of flying. These four stages are definitely subdivided, from the beginner with the stationary engine to the stage when the pupil has mastered the art of ordinary straight-ahead flying with no "frills." Then come fields 5 and 6, also grouped together (and with special living quarters alongside) where "acrobatic flying" is taught, there being two distinct stages in this intricate and dangerous work. When the pupil has mastered the various flying "stunts"—spirals, loops, side-slips, etc.—he goes to field 7 for ten days' hard training in bombardment and night-flying drill. Then to field 8, the "Combat Field," for serious combat work, which means learning all the manaeuvres that are used by the skilled airmen at the front.

At another point some distance away I was equally impressed with both the work in progress and the working plans of the so-called "Air Production Departments." This important center of activity, which is typical of several now in course of construction, covers a tract of land over six miles long by a mile and a half wide, where the construction, assembling, testing and repair of American aeroplanes will soon be going ahead full tilt, on a scale never before known. The work splits into four main divisions: transportation, production, construction and supply.

As for the Americans overseas, they are winning an ovation wherever they go. In England you can always tell when a trainload of Americans is coming through by the Stars and Stripes decorating the embankments along the tracks, and by the fact that half the town is down at the station to cheer the "Yanks." They are winning a great and glorious reputation because they have proved themselves to be worthy of all the fighting traditions of their forefathers and because they have gone out on the battlefield and shown that they fight and fight and fight!

Royal Geographical Society Honors Captain Bartlett

Captain Robert A. Bartlett, the famous explorer, member of the Aero Club of America and the Air Service Institute of the United States, who was prevented by the war from using aeroplanes for arctic exploration has again been honored for his achievements. The Royal Geographical Society of Great Britain has awarded him the Back Grant which was founded by the bequest of Admiral Sir George Back for the reward and encouragement of scientific geographers and discoverers. The award is in recognition of Captain Bartlett's distinguished leadership after the loss of the Karluk.



The Back Grant

This is to Certify *that the above grant founded by the bequest of Admiral Sir George Back for the reward and encouragement of scientific geographers and discoverers was awarded by the Council of the Society in 1918 to*

Captain R. A. Bartlett

for his distinguished leadership after the loss of the Karluk.

T H Holdich
President

Alfred P. Maudslay
Douglas Carruthers
Honorary Secretaries

Arthur R. Hinks.
Secretary

May 1918.

FOREIGN NEWS

AUSTRIA

The official communication issued by the War Office today says: "Thursday night the enemy dropped thirty bombs on Douzingreig. Several of the inhabitants were killed and a hospital was damaged."

FRANCE

The French official statement on aviation for August 24 says:

"On Friday nine German aeroplanes were brought down or put out of action and a captive balloon was burned. The same day our bombing planes dropped 12,300 kilos of projectiles and fired several thousand cartridges in the region of Anizy-le-Chateau, Brancourt, Landricourt and Mortier Forest, where aerial observers had signalled impotant enemy reserves and convoys."

The official communication upon aviation for August 25 says:

"It was impossible to carry out any bombing operations during the day. During the night the weather improved and our bombing machines immediately took the air. More than twenty tons of explosives were dropped behind the battle front and on stations, which were damaged, and bivouacs in the region of Ognolles and Guiscard.

"Stations, railways and assembly zones at Laon, Anizy-le-Chateau, Jussy, Chauny, La Fere, Ham, Semide, Pontavert and Guignicourt were besprinkled with projectiles. Numerous hits were reported on the objectives, and fires broke out at Laon, Ham, Guiscard and Guignicourt."

GREAT BRITAIN

The statement for August 21 reads:

During the period from August 15 to August 18, inclusive, Royal Air Force contingents working with the navy have bombed the following military objectives: Solvay works at Zeebrugge, the docks at Bruges, batteries at Westende, the Ostend docks, and aerodromes at Zeebrugge, Aertrycke, and Middelkerke; the Passchendaele Canal, the ammunition dumps at Stalhille, Middelkerke, Leffinghe, and Zeebrugge; the Bruges Canal, and enemy shipping.

"Between fifteen and sixteen tons of bombs were dropped and good results were obtained. Reconnoissance, photographic, and anti-submarine patrols have been maintained. During the course of these operations nine enemy machines have been destroyed and eight driven down out of control. We have lost four machines, one of which landed in Holland, and three officers have been wounded.

"In home waters during the same period anti-submarine, convoy, and hostile aircraft patrols have been maintained by seaplanes, aeroplanes, and airships. Submarines have been sighted and attacked and mines located and destroyed. One of our machines has failed to return from patrol."

"Some enemy machines which attempted to interfere with our aeroplanes were prevented from attacking by our escorting squadrons. All the machines engaged in this raid returned safely.

"The Bruges docks, the railway at Roisel, and a number of enemy dumps were heavily bombed by us. The total weight of bombs dropped during the day amounted to fifteen and a half tons.

"A good deal of reconnoissance, photography, and observation work was also carried out by our airmen.

"In the fighting, thirteen enemy machines were destroyed and six driven down out of control. In addition, one hostile aeroplane was shot down and another brought down out of control by fire from the ground. Four German balloons in the Merville sector were set on fire by one of our airmen. Seven of our machines are missing.

"Unfavorable weather prevented any flying at night."

Destruction of twenty-two German aeroplanes was reported August 23 in the official communique issued by the Brittish air ministry. In additon, a hostle balloon was destroyed. Eight British machines are missing. One reported missing the preceding day has returned to its base. One of the destroyed German planes was a large bombing machine.

Districts behind the lines were heavily bombarded.

Aeroplanes played little part in the advance of General Byng's troops, it was said, due to mists.

During the last fortnight 328 German aeroplanes have been brought down by our airmen on the Western Front, and 134 driven down out of control. The enemy balloons shot down in the same period amount to thirty-one. The total weight of bombs dropped by us during this period was 594 tons.

The British will probably by the end of this month have made more raids on Germany in four weeks than Germany has made in four years on England. It is now an open secret that a distinguished air general is now in command of the independent air force which does the raiding on Germany.

There was a rumor in London that the independent air force had bombed Berlin. Though this did not prove to be true, they bombed four important towns on the same night, and the Rhine is now as much a part of the front as the Somme or the Oise.

The effect of all this is military as well as moral. Whereas the Germans have been able to keep their best fighting pilots at the front, they are now compelled to keep large formations of fighting machines to protect their own towns in Germany.

The fighting in all the recent raids has been very severe and Allied machines have had to undergo a continuous battle from the frontier to their objectives.

The Handley Page and other bombing machines are, however, very difficult to knock out, and the British losses have been surprisingly small.

There seems to be no doubt that this form of offensive will be developed to such an extent as to cripple the German air power on the immediate fighting front.

On the night of August 22-23 our squadrons made a concentrated attack on hostile aerodromes at Folpersweiler, on which eight tons of bombs were dropped. Several large sheds and hangers were set on fire.

One of our machines attacked the chemical factories at Saaralben (Lorraine), where excellent results were obtained. Fires and explosions were seen after the attack. Various railways and targets were also bombed with good effect. Three of our machines are missing.

On the morning of August 23 our machines successfully attacked the hostile aerodrome at Buhl (Alsace-Lorraine). The railway junction at Treves was also attacked and several bursts were observed in the station and on the railway. All our machines returned safely.

The machine previously reported as missing on the night of August 18-19 has been located undamaged.

On Friday night, in spite of thunder storms, our squadrons carried out operations against the hostile aerodrome and the railway junction at Ehrange. A fire was caused and considerable damage was done at the latter place. All our machines returned safely.

On August 23 our machines co-operated closely throughout the day with our troops in the battle area, keeping in touch with their advance and reporting enemy movements. Observation for artillery fire by balloons and aeroplanes was carried on as usual.

Our low flying squadrons constantly attacked with machine gun fire and bombs the German infantry, wagons and guns, throwing them into confusion. Our squadrons, co-operating with tanks, silenced enemy batteries which were impeding our advance.

A bombing raid on the German aerolrome at Cantin, southeast of Douai, was carried out by some of our scouts and escorting machines. Several of the hangers were set on fire by direct hits, and machine gun fire was opened from a very low height on troops and transports near by. An enemy machine, which attacked our raiders, was shot down. All our machines engaged in the raid returned safely.

A total of twenty-six tons of bombs was dropped by our airmen during the day. Twelve enemy machines were destroyed by us in air fighting, and two more were brought down by fire from the ground. Three other hostile machines were driven down out of control. Four German balloons were shot down in flames. Four of our machines are missing.

At night, though the weather was cloudy, nearly five tons of bombs were dropped by us without the loss of any machines.

On August 24 our airmen carried out another day of varied work, including much low flying and artillery observation.

Enemy machines were not very active until the evening. Seven hostile aeroplanes were driven down by us and five German balloons were shot down in flames. Ten of our own machines are missing.

During the twenty-four hours we dropped forty-three tons of bombs, the Valenciennes and Cambrai railway connections being attacked among other targets. All our night-flying aeroplanes returned safely. We succeeded in destroyed two enemy night-bombing machines.

On the 25th inst. our machines successfully attacked a hostile aerodrome and the railway stations at Bettembourg and Luxemburg. Excellent results were obtained on the railway stations.

Chemical factories at Mannheim and the railway station at Frankfort were successfully attacked on the night of 25-26th by the British independent air force. All the British machines returned safely to their base.

"Between August 19 and August 25," says an official statement issued by the British Admirality, "the air force with the navy bombed the Bruges docks, the Bruges and Zeebrugge mole, the Zeebrugge Canal, the Ostend docks, St. Pierre Capelle, the Solway works, and the towns of Middelkerke, Westende and Maria Aalter. We also dropped bombs on German aerodromes at Costacker, Ghistelles, Mariakerke and Vlisseghem.

"Approximately twenty-seven tons of bombs were dropped. At Bruges many good bursts were observed, direct hits being made on the submarine station. Bursts were also observed on the storesheds on both sides of the west basin. Two large explosions and two big fires were caused in the docks.

"Anti-submarine, reconnaissance, photographic and fighting patrols have been maintained. Enemy shipping and land batteries have been attacked. Our fighting squadrons have destroyed five enemy machines and driven down five others out of control. Four of our machines are missing.

"In home waters during the same period, seaplanes, aeroplanes and airships have maintained their watch and submarine convoy and hostile aircraft patrols have been active. Enemy submarines have been sighted and attacked and mines located and destroyed."

GERMANY

The German official communication of August 25 upon aviation says:

"Our bombing squadrons during Saturday night dropped on harbor works, railway stations, military works and camps of the enemy eighty-two and a half tons of bombs."

In an air raid on Ludwigshafen Sunday night a great number of bombs were dropped, according to the Frankfort *Zeitung.* Much damage was done to buildings.

Ludwigshafen is in Rhenish Bavaria, opposite Mannheim on the Rhine. Prilor to the war it was ranked as a manufacturing city, and the Germans have turned the factories there into plants for the manufacture of war supplies. Mannheim, also a war supply center of the Germans, has been bombed from the air several times recently.

ITALY

The Italian War Office issued the following statement on August 25:

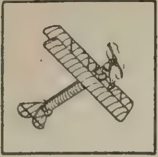
"Last night our aeroplanes again dropped four and a half tons of bombs on aviation camps on the Friuli Plain in the Lagarina Valley, causing large fires.

"Hostile aircraft dropped bombs on the city of Padua, slightly damaging some buildings. There were no casualties."

TURKEY

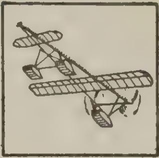
A Turkish official communication issued August 27 says:

"Enemy airmen again attacked Constantinople Sunday night. Our barrage prevented them from flying over the city, but some bombs were dropped in the suburbs. No damage was done."



MODEL NEWS

Edited by John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St.,
Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg.,
Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W.,
Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street,
Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautic Engineering

(Continued from last week)

The air reservoir made from the male end of a smaller ferrule than the size used for the piston is placed over the first hole from the right of the tubing as shown in Figure 7. The brass disc with a ⅛" hole is then soldered in the bottom and a ⅛" piece of brass tubing, long enough to allow the end being 1½" away from the turn, is soldered into the hole (see Figure 7 for reference).

The other end of the brass tubing is then soldered into the 5/16" hole in the crankcase portion of the large ferrule. Take care to have it at right angles to this piece. Next, after bending two pieces of ⅛" brass tubing to the shape of the piping, leading from the valve casing to the cylinder heads, they are soldered at each point, after which they should be tested to make sure they are not clogged up with lead. If necessary put the reamer in again to clean out any excess lead.

The piston may now be inserted as in Figure 15, and the crankshaft put in place, when the connecting rods can be sprung over the stud or crankpin. A large washer should be soldered to the crankshaft just near enough to the valve casing to allow it to turn freely.

The motor when finished should look like the three views shown at the right of the drawing.

The motor is then filled with oil and worked by putting the end of the propeller shaft into the jaws of a drill and revolved until it works freely. When the pistons are inserted and it looks as if they fit too tight, they should be twisted in fine emery cloth to make them slide easier.

A few tools that will help in the construction of small motors are shown in the accompanying drawing, consisting of a small blow torch for fine soldering work, a hand lathe made from an ordinary hand drill and a reamer, by using the handle of an ordinary file.

The blow torch is made from two pieces of brass tubing, the outer tubing being ¼" inside diameter, the inner tubing being ⅛" outside diameter. The construction is clearly shown in the cross section. The large tubing supplies the gas, while the pressure of air is supplied by the smaller diameter tubing. The inside and outside tubings should be soldered where the air intake tube goes through the outer casing to insure against leakage of gas. The size of the flame is regulated by turning the gas off or on and blowing in proportion to the amount of gas used. It needs but little practice to master this blow torch, and much better work can be done than if a clumsy soldering iron were used; in fact, it is impossible to solder some of the parts without this blow torch.

The hand lathe needs no explanation other than drawing, as the model builder can see how the hand drill is mounted on blocks of wood that are split, and then clamped together to hold it in place. The rear block is used to steady the drill when in use. The tool rest is made by bending a strip of brass or iron to the shape shown and mounted on a block of wood. The cutting tool is made from a square file, the tip being ground to the shape in the detail just above. When operating the lathe the left hand is used for turning the wheel in the direction shown by the arrow; the tool is held by the right hand. The lathe will be found useful for turning down small pieces, such as the crank pin, the end of the crank case, cutting of tubing, etc.

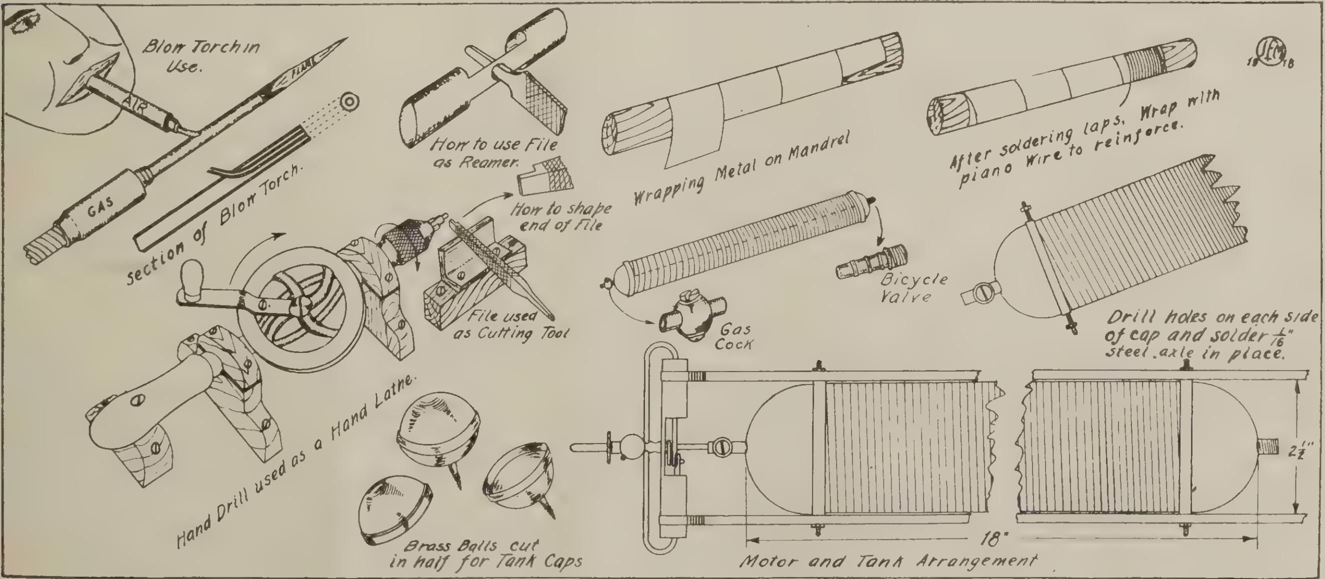
The reamer is used when a hole cannot be drilled large enough by the ordinary size drill, such as the 5/16" hole in the crankcase.

Tank Construction

Before starting on the tank it would be to the model builder's advantage to buy the balls to be used for the tank ends first, because it is necesasry to use a wood mandrel to wrap the metal on, and the mandrel must be the size of the balls.

The balls are ordinary curtain rod decorations, the larger end, which is the top, is the part used. These balls are just joined together and can be pried apart with a knife.

(To be continued)


Blow Torch in Use.
FLAME
AIR
GAS
Section of Blow Torch.
How to use File as Reamer.
How to shape end of File
File used as Cutting Tool
Hand Drill used as a Hand Lathe.
Brass Balls cut in half for Tank Caps
Wrapping Metal on Mandrel
After soldering laps, Wrap with piano Wire to reinforce.
19 18
Bicycle Valve
Gas Cock
Drill holes on each side of cap and solder 1/16" steel axle in place.
2½"
18"
Motor and Tank Arrangement

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Tell Us Your Troubles

The purpose of this column is to answer in an adequate way the thousand and one little questions that confront the cadet aviator; questions which, insignificant at first glance, yet exert a direct influence on the very life of the flier. Safe flying is a capacity for taking infinite pains. All legitimate questions concerning flying will be given answer in this column.

Question—What is an Immelman turn and explain it?

Answer—The Immelman or Gott-in-Himmel turn is a kind of roll-over, without use of the aileron. An authority states that "to get best results start cross wind and turn away from wind." It is presumed that most aviators will want the best results, as they are scarcely more than fifty per cent fatal, whereas doing the thing in an indifferent and careless manner is not only very harmful to the flier but exhibits an improper and unmilitary disregard of government property.

Question—What is the Me-und-Gott Glide?

Answer—The Me-und-Gott Glide is an up-side-down glide and begins the same as the Gott-in-Himmel turn except that when on back the motor is cut and the stick pushed all the way forward, rudder in neutral.

This Glide was named in honor of the German kaiser who had a vision one night in which he saw himself and Gott doing the perilous stunt in Paradise. There isn't an American aviator, bless them all, who wouldn't do the thing with the kaiser—being careful to cut all the struts and make his will before he accompanied Bill aloft.

Question—How can I keep company with three Fairfield girls, pay for my war-risk insurance, and a Class "A" compulsory allotment, pay for having my white hat bands starched and ironed, and shoot craps during meal time—all on my government pay? CADET.

Answer—We don't know. If we could answer financial questions like the above we'd have too much money already to be in any army—account of physical disability due to locomotor taxicabia, and wine, women and song in general, not in line of duty.

Question—How can I learn to fly backward in a Curtiss? I'm tired of flying just the one direction. CADET.

Answer—Take up a short paddle with you, resembling a boat oar but not so long. Hold machine down about twenty degrees for a few seconds to obtain speed. Pull stick back slowly at first, and faster as plane goes further into loop. Exactly at the moment of emerging from loop, cut motor, thrust paddle out from the car, and row industriously. Plane will slowly start moving backward. Apply juice and continue as in ordinary flying. The easiest and best method of coming out of this reverse is to apply a lighted match to petrol tank.

Question—Suppose, on my first assignment when I go into action on the western front, I bring down three enemy planes on morning patrol. Would this give the privilege of asking for assignment for afternoon patrol the same day, or should I wait until my regular turn? CADET.

Answer—Why be a hog? Why end this war all at once? Remember, mate, there's a lot of us that haven't got near the fight yet. Where do we come in if we don't get across in time to watch the Frenchies hook the medals on you—all there's room for, anyway? Let's make this a union war, and everyone in on it! And besides,

He who flies the eight-hour way,
May live to die some other day.

M. E. F.

The Editor Answers

Ermyntrude—No, dear lady, what you saw was probably not a training plane from Little Silver, New Jersey. It was probably a mosquito. There is a sharp difference between them, as you will notice, particularly at the front end.

The Eyes of War

By Ghart Pitt

Like a gauzy speck in the pearling dawn,
We drift through the silent skies,
Over No-Man's Land, where the smoke balls spawn,
And the deadly gases rise.
We mark the spot where the battery stands—
Where sappers toil on the trench-scarred height.
We map each mile of a hostile land,
Where millions writhe in the battle-blight.

No silvery bugle to speed our flight,
Nor the flutter of banners gay;
Not a war-steed's stamping for the fight,
As we rise at break of day.
Only the song of the wind in the planes—
A thrill that lives in the day-dawn's glow—
A shifting vision of country lanes,
That wave like ribbons below.

MUTT AND JEFF—And Jeff Was Right . . . . By BUD FISHER

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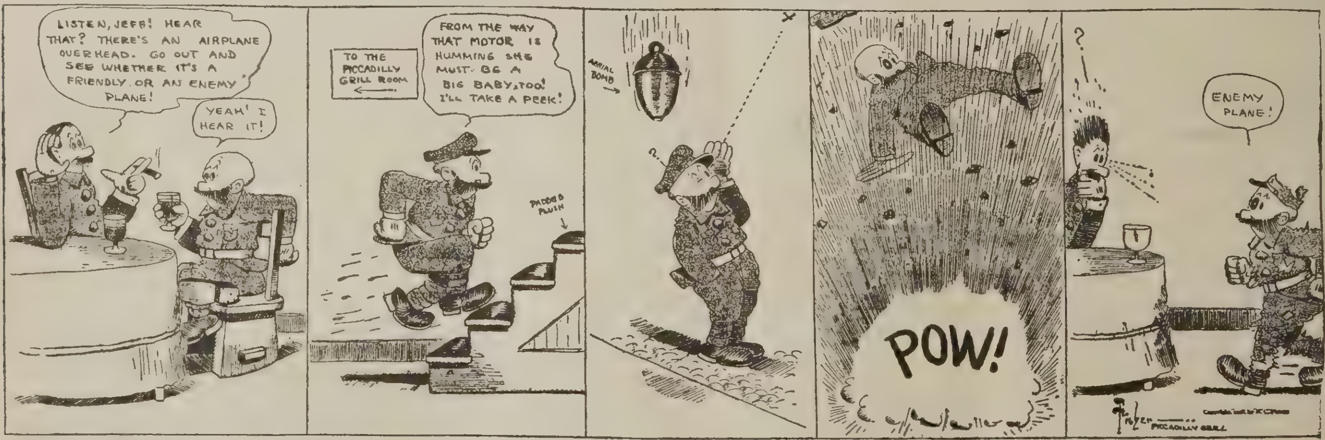
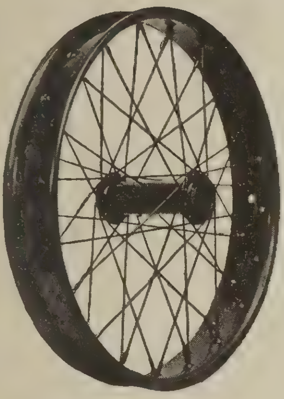

LISTEN, JEFF! HEAR THAT? THERE'S AN AIRPLANE OVERHEAD. GO OUT AND SEE WHETHER IT'S A FRIENDLY OR AN ENEMY PLANE!
YEAH! I HEAR IT!
TO THE PICCADILLY GRILL ROOM
FROM THE WAY THAT MOTOR IS HUMMING SHE MUST BE A BIG BABY, TOO! I'LL TAKE A PEEK!
PADDED PLUSH
AERIAL BOMB
POW!
ENEMY PLANE!
Fisher — PICCADILLY GRILL

National Wire Wheel Works, Inc.
***of* Geneva, New York**



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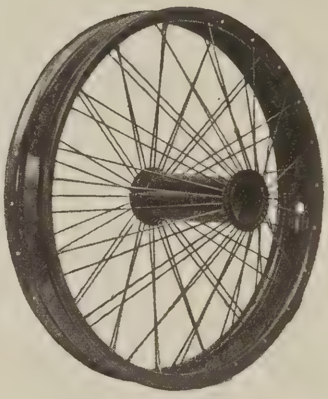
to accept orders for
wire wheels made to fit
all types of Airplanes

DELIVERIES ARE PROMPT
WRITE FOR PRICES



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THE 17 degrees from 6B softest to 9H hardest satisfy every requirement.

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17 black degrees
6B softest to 9H hardest
with or without eraser tips
and hard and medium copying
—all perfect

FREE!
(Except packing and postage)
Send 6c in stamps to cover actual cost of packing and postage and we'll send FIVE trial length VENUS Pencils and VENUS ERASER for test!

American Lead Pencil Co.
240 Fifth Avenue New York
and Clapton, London, Eng.

(*Continued from page* 1261)

mont Park at 2:40 P. M., making 2 hours, 48 minutes for the northbound through trip.

Remarkable Records of the Aerial Mail Service

During the month of August the Air Mail Service between Washington, Philadelphia and New York was conducted without a miss, hitch or serious delay of any character.

The operations for the month were perhaps the most remarkable in the history of aviation. There were 27 flying days of which 100 legs of the journey had to be performed, and in that month there were but two forced landings. One with a delay of 7 minutes and the other with a delay of less than 10 minutes. One forced landing was made within four miles of Belmont Park at the end of a journey. It was caused by a break of the magneto shaft. The other forced landing was made on a flight where fog and haze obscured the ground and for the purpose of picking up the course because the compass failed to work.

The total possible miles of flight was 11,961 of which 11,957 miles were completed.

During the first ten days of the month the routes were flown by Lieuts. Edgerton, Kilgore, Bonsal, Webb, Culver and Miller without a miss, hitch or forced landing. During the last twenty days of the month the routes were operated by civilian flyers of the Post Office Department. The perfect scores were made by aviators Max Miller and E. V. Gardner. Aviators Maurice Newton and Robert Shanks on the Philadelphia end of the route each had one forced landing, giving them a score of 99 per cent.

A total of 5,879 pounds of mail was carried on the trips.

A most rigid maintenance system on all fields was maintained with the result that the month closed without a single plane of the 15 being laid up in the shop for repairs.

This is a very exceptional record indeed and Postmaster Burleson, Second Assistant Postmaster Praeger, Captain Lipsner and the aviators and aerial mail staff deserve congratulations.

American Candor Envied in London

The American War Administration's policy of letting the Germans know what they must expect meets with the warmest approval here and *The World's* editorial justifying it is widely quoted.

A typical example of the soundness of this procedure is furnished by the extreme nervousness exhibited by German cities, even Berlin itself, over the steady expansion of the area of operations of the Allied bombing planes and the expectation that in the near future the Allied supremacy in the air will reach a point where the worst of German apprehensions on the scare are sure to be realized.

There is here a fine opportunity for serviceable candor on the part of the Allies, especially as the military objectives in Germany marked out for bombing are so numerous and widespread that no really effective measure for their protection is possible.

Maurice Barres leads the way with a hint to the Germans that they have only had the merest foretaste up to now of what is in store for them. It is no secret here that schemes immense in extent and backed by material that is really inexhaustible have been perfected, as the Germans will learn before long. Meantime the American policy of publicity holds the field and there is sincere hope that it may be imitated here. —*New York World.*

Plan Aeronautics Chairs

Several large sums of money have been given recently to leading English universities for the establishment of professorships in aeronautics, it is announced. The University of London made announcement on August 15 that it not only had accepted a gift, but proposed to start systematic work in the science of aeronautics as soon as a suitable appointment could be made to the chair.

Two years ago, when some of the oldest colleges at universities like Oxford and Cambridge were taken over in connection with the training of air pilots, there was some misgiving in educational circles over this invasion of scholastic haunts, but since that time several leading educators have issued statements declaring that this invasion is "no more than a symbol of the rennaissance of learning and an adaptation of old learning to modern needs."

Although universities still maintain that the old colleges will be restored to their traditional use after the war, it appears evident that the influence of aeronautical work now being done there will have a lasting effect on higher education in England. Already some of the more modern universities are discussing the practicability of offering a special degree in aeronautics in connection with special courses of teaching. These courses would be aimed at combining the work of experimentalists and theorists with that of practical fliers in the development of what is destined to become a big factor in industrial and national life.

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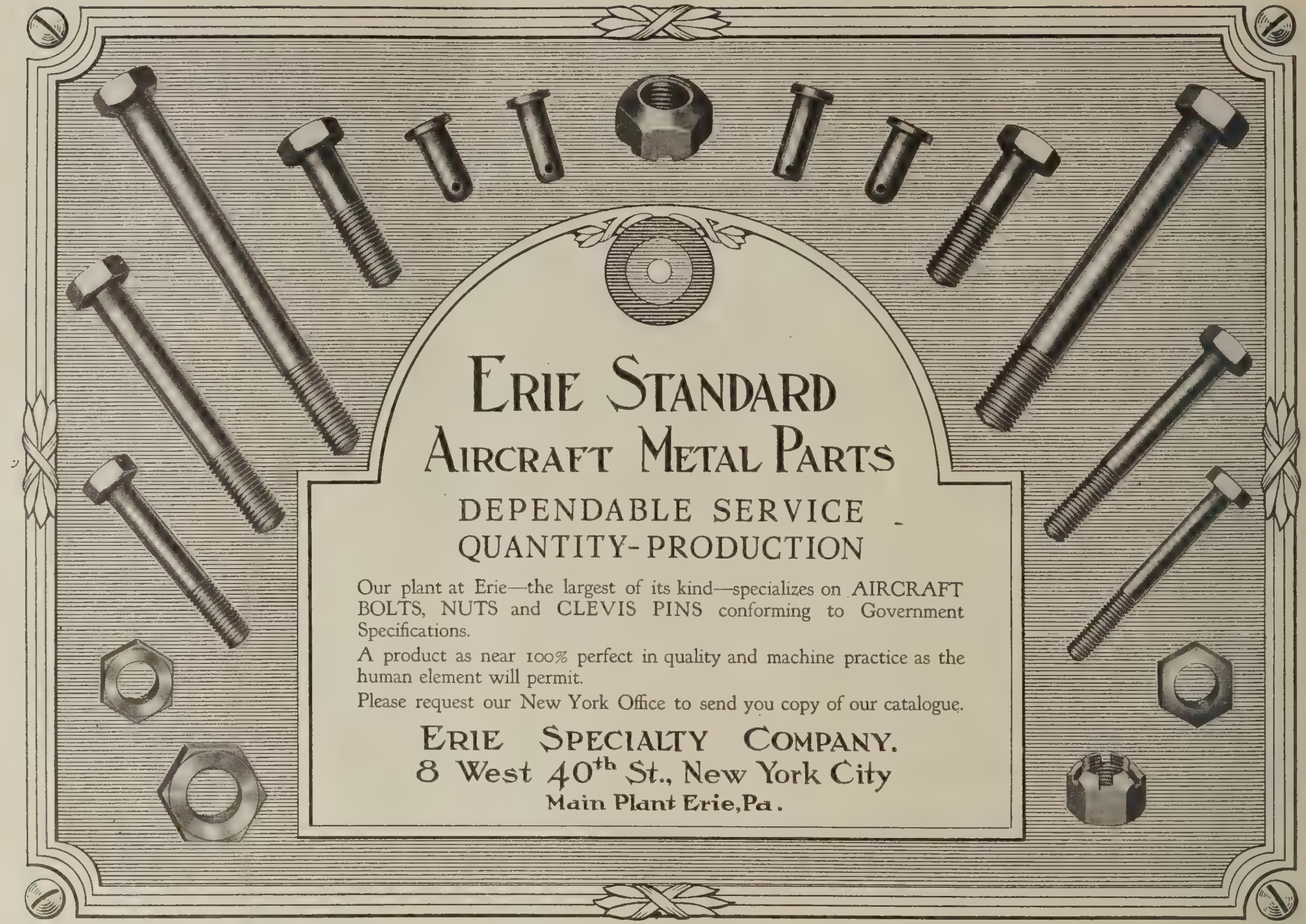

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A product as near 100% perfect in quality and machine practice as the human element will permit.

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ERIE SPECIALTY COMPANY.
8 West 40th St., New York City
Main Plant Erie, Pa.

(*Continued from page* 1280)

Platt, Charles Henry	SLA; SBI
Puckett, Johnnie Robert	SLA; SBI
Poynter, William Bruce	SLA; APR
Park, Leonorr L	UIU
Putnam, George Wise	SLA; BFT
Pepin, William Henry	SLA; ELA
Petraborg, Jarrold Anthony	SLA; AAD
Pepper, Joseph Harrold	SLA; DAP
Pope, Ralph Linder	CPA
Pearson, Alexander, Jr	WFO
Provosty, Albin Alexander	SLA; BFT
Preston, Whiting H	PFO
Price, Edward Foley	CAF
Powell, Orlo A	BST
Perdue, Paul Goode	WFO

Q

Quinn, William Patterson	SLA; EOT
Quaw, Clayton Duane	SLA; RSD
Quarenberg, Paul Richard	SLA; AAD
Quick, Franklin Pierce	SLA; CJW
Quin, Langdon C	HHN

R

Robins, Fernando A	WFO
Runser, Harry Jennings	SLA; AAD
Roberts, Lewis Holloway	SLA; SBI
Raney, John Kelley	SMM
Reynolds, Harry I	APR
Riba, Leander W	SLA; TFT
Reid, Walter Davis	SLA; CRI
Rasmussen, Harry	FRF
Ramsey, Robert William	SLA; CAF
Readio, Roger F	PWM
Rivera, Reynaldo J	PWM
Rogers, Edward B	PWM
Russell, Horace W	PWM
Riddle, Sydney Walker	SLA; GLC
Ryan, James J	SLA; VBW
Richards, Fletcher D	WFO
Russell, Foster	WFO
Ringholm, Howard Emanuel	SLA; AAD
Rinker, Harry M	WFO
Rice, Clyde Arthur	SLA; SMM
Ridlon, John R	ARV
Reakirt, Robert H	FRF
Record, Fred Augustine	SLA; RSD
Richardson, Baxter K	LDT
Read, Joseph F	WFO
Radford, William A	WFO
Ruegg, Joseph A	WFO
Ryan, Herbert W	FOB
Russell, Edward C	DAP
Raeder, Elmer Warren	SLA; CJW
Rouse, Charles Louis	SLA; AAD
Rowland, John C	DMA
Reierson, Gustav	SLA; KST
Roberts, Ralph Roscoe	SLA; AAD
Ritter, Paul Noel	SLA; CGC
Rummel, Jay A	FRF
Roberts, Alton T	CPA
Roberts, Orno Bentley	SLA; CJW
Roche, Leslie Arthur	WFO

S

Smith, Warner G	GLC
Smith, John Jay	SMM
Smith, William Singerly	SLA; CGC
Smith, Herbert C	PWM
Smith, Rollins Curtis	SLA; CUI
Smart, Oliver M	GLC
Shank, Harry E	PWM
Sporlein, Louis W	PWM
Stallings, Alcy L	PWM
Stapleton, Charles E	PWM
Stauffer, John L	PWM
Skelly, John Sweetman	SMM
Spencer, Eben Eelden	SMM
Swinson, Casper Dorman	SLA; CAF
Schuch, Leland Sanford	SLA; RSD
Sattler, Walter F	LDT
Spainhour, Carl M	LDT
Sullivan, Dennis J	LDT
Sprague, Lester Willard	SLA; CRI
Saunders, John J	BST
Slocum, Russell Wade	SLA; AAD
Stuart, Percy Clark	SLA; ECT
Schmitt, John Robert	SLA; CRI
Sarthou, Alexander E	GLC
Savage, Clair R	GLC
Sevey, Willia B	GLC
Staley, Mortimer L	GLC
Stanton, Edgar	CRI
Schroeder, Walter C	DMA
Southwick, Flen Harlan	SLA; CAF
Sawyer, William C	WFO
Stough, Robert A	WFO
Saal, Raymond H	BST
Schumacher, Herman O	BST
Sayre, Robert Harold	SLA; MAC
Sawyer, William George	SLA; TFT
Street, Albert Burton	SLA; Note 2
Salisbury, Henry Wood	SLA; HHN; FRF
Stacy, Owen Pratt	SLA; TFT
Strong, William M	DAF
Stubbs, Arthur Rollin	SLA; CJW
St. John, Graham Mead	SLA; CRI
Spiers, Robert Hugh	SLA; CAF
Spalsburg, Donald Campbell	SLA; CJW
Stratton, Frank A	CJS
Stone, Alonzo Earl	SLA; CJW
Snelgrove, Herbert C	SMM
Swigert, Ernest Goodnough	SLA; RSD
Shrake, Byrl H	FRF
Siegmann, George Adam	SLA; DMA
Stelle, Harry Wilson, Jr	SLA; CRI
Skerratt, John Webster	SLA; CAF
Sullivan, Thomas L	SLA; TFT
Sibley, Eugene	PFO
Schoepf, Alfred W	PFO
Simpson, Thornton G	VBW
Searing, Hudson R	HHN
Schiffer, Jack Walter	FLA
Strattan, William	FLA
Scott, Neal J	WFO
Sadler, Harry M	CPA
Sessions, Henry Few	SLA; TFT
Sieg, Bine Wendall	SLA; TFT
Springs, Laertes P	PFO
Smith, Joseph Newton	SLA; CJW
Shaw, Walden Willard	MJA; Note 9
Simons, Seymour B	Note 3
Struthers, Parke Hardy	SLA; Note 2
Sadler, Dudley Karklitz	SLA; Note 2

T

Tourtellot, George P	WFO
Tiernan, James Peter	SLA; CRI
Tuttle, George Woodbury	SLA; HHN
Trainer, Lloyd Merrell	SLA; SMM
Thorne, William B	BST
Tefft, Lionel V	GLC
Tait, Trevor S	WFO
Tieman, Frederick A	PWM
Tighe, Louis Thomas	SLA; AAD
Thomson, Henry	LDT
Taylor, Whitman	SLA; CRI
Thompson, James	SLA; KST
Turnbull, William	PFO
Thorne, Edward Henry, Jr	SLA; CGC
Thompson, George Levi	SLA; CJW
Tandy, Howard Nelson	SLA; APR
Thomas, Arthur Edgar	SLA; KST
Thompson, John Hay	SLA; KST
Tourtellot, George Platt	SLA; KST
Taylor, Bayard C	WFO
Twaddle, Chester	WFO
Taylor, William Lathrop, Jr	SLA; AAD
Thompson, John B	SLA; CGC
Townsend, Frederic D	PFO
Turner, Frank G	FRF
Taylor, Thomas P., Jr	SLA; TFT
Tidd, Luzerne M	SMM
Tupper, Preston E	TFT
Taylor, Whitman	BST
Tobey, Paul T	TFT
Talbot, Sheridan	PFO

U

Underhill, Donald Prince	SLA; ELA

V

Velte, Charles Henry	SLA; RSD
Van Auken, Wendell G	PWM
Van Arsdale, Ray Century	SLA; GLC
Van Bergen, Kenneth Brown	SMM
Von Hake, Richard A	PWM
Von Thaden, Herbert	SLA; GLC

(*Continued on page* 1291)

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Their SIMPLICITY STRENGTH and SERVICE make them the logical equipment for the Modern Airplane.

Weight 36 pounds complete with tires built for craft weighing 2100 pounds

WHEELS and LANDING GEARS built for any size machine

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Everybody is familiar with these well known concerns and it is generally conceded that the manufacturing methods they employ represent the most advanced ideas in present day shop practice.

But they don't adopt any device or process as standard until they have tried it out thoroughly. It's therefore worth noting that they were among the first of our present users to appreciate the advantages of the

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over the old cut-and-try method of eliminating vibration from the rotating parts of high speed engines, motors, turbines, etc.

With ordinary shop skill and a "Carwen" 100 crankshafts (or armatures) can be put in *running* balance —not merely static balance—in an 8 hour day.

These machines are just as practical—from both operation and cost standpoints—in small plants as large ones, and we make them in sizes suitable for balancing objects weighing all the way from 5 oz. up to 15,000 lbs.

Send for descriptive booklet.

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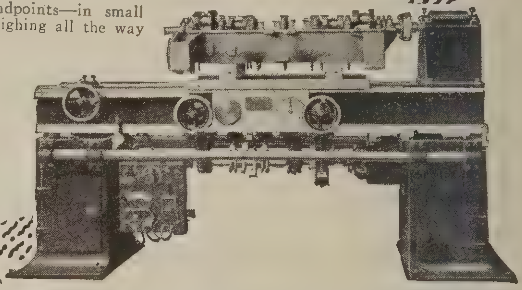
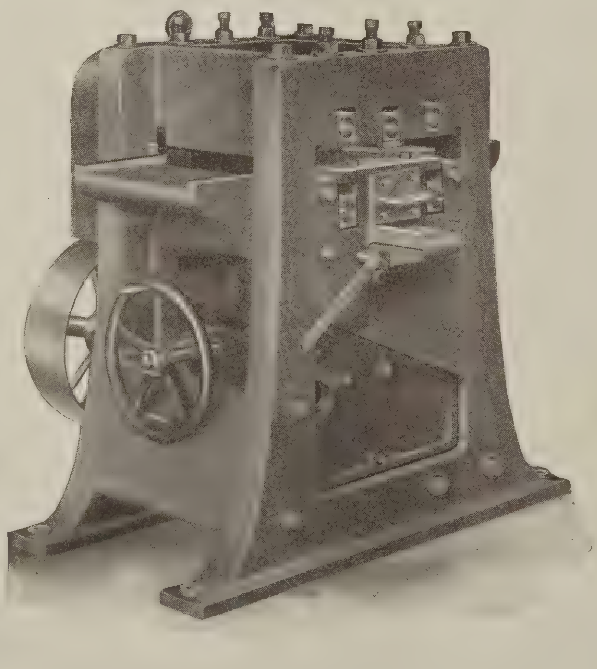


Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a



Whitney Scraping and Toothing Machine

WHITNEY Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

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RESISTAL

BECAUSE of the absolute necessity for protection to the eyes, with perfect vision, for Army and Navy Aviators, the U. S. Bureau of Standards conducted two exhaustive tests of non-shatterable glass in March and May, 1918.

Every possible severity was employed in these tests, even to firing 30-calibre bullets at the glass at a distance of 25 yards, and by repeated severe blows of a falling steel weight from increasing heights until rupture occurred. Also scientific optical tests were made for exact analyses of the qualities of vision.

The following extracts from the conclusions of these reports speak more volumes for RESISTAL than we, the manufacturers, would otherwise dare to claim:—

From the report of March 25th, 1918: "The relatively increased non-shatterability of laminated (RESISTAL) glass and its comparatively good transparency and rigidity even after puncture, give it great importance in devices for protecting the eyes and face."

From the report of May 9th, 1918: "In view of the tenacity with which celluloid holds glass and prevents it from shattering, the slightly lower light transmission of such a combination is probably compensated by the superior protection offered to the eyes in case of accident to the goggles." (This is RESISTAL.)

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2 styles of RESISTAL EYETECTS for aviators

(Continued from page 1288)

W

Williams, Edward B.	EOT
Williams, John G.	WFO
Williams, Martin D.	SLA; VBW
White, Julius Augustus	SLA; CWT
White, Edward O.	WFO
White, Frank E.	EOT
Walker, Roy M.	EOT
Walker, Harry W.	PWM
Whitehead, Fred Erie	SLA; AAD
Wilbur, Clifford H.	WFO
Wilson, Floyd Altin	SLA; CGC
Wilson, Joseph A.	LDT
Woodard, William Asa	SLA; CRI
Wuest, Jacob W. S.	PFO
Whitelaw, James Cameron	SLA; RSD
Winters, Victor De Witt	SLA; WFO
Wall, William Powell	SLA; LDT
Walker, Lloyd Blankenship	SLA; CRI
Wood, Walter Judson	SLA; RSD
Wellman, Harrison W.	WFO
Winslow, Julian E.	WFO
Wheat, Robert Hasse	SLA; SBI
Wise, William Clair	SLA; CRI
Weaver, Charles James	SMM
Wiley, Silas Moore	CPA
Wachtel, Morris Frohman	SLA; TFT
Whiteley, Robert W.	WFO
Wolcott, Henry N.	GLC
Wherritt, Russell	WFO
Widenham, John M.	FRF
Wehlgemuth, Brune E.	WFO
Wright, Harry J.	LDT
Watkins, George H.	EOT
Wooldridge, Henry E.	EOT
Willcox, Sidney G.	Note 3
Walker, Franklin C.	Note 12
Watson, James Leslie	SLA; Note 2
Williams, Paul Deming	SLA; CGC
Warner, Sam B.	LHV
Williams, Philip Landram	SLA; KST
Williams, Lloyd Harrington	SLA; KST
Wallace, Arthur Emmett	SLA; WFO
Wheeler, Irwin	DMA
Warfield. Robert LeRoy	SLA; CFT
Walls, William Ralph	SLA; CFT
Wine, Lyman Arthur	SLA; CAF
Wilkins, Paul California	SLA; ELA
Williamson, Joseph Raymond	SLA; CJW
Woodyatt, Harold Francis	SLA; CRI
Walecka, Joseph L.	SLA; VBW
Whiteley, Robert Vernon	SLA; KST
White, John Kennedy	CPA; DAP
Wilkinson, Harry E.	DMA
Watson, Eldon Levings	SLA; KST
Warner, Harry William	SLA; CJW
Wilson, Maurice Webster	SLA; WFO
Wasserman, Max Judd	SLA; CRI
Winter, Leon Arthur	SLA; CIW
Whitney, Richard S., Jr.	WFO
Wescott, Millard A.	PFO
Winslow, James W.	PFO
White, Everett E.	FLA
Wilbur, Fred V.	LHV

Z

Ziegler, Clarence C.	CRI
Zerwekh, Paul William	SLA; KST
Zender, Frederick A.	WFO
Zanetti, Silvio	LDT
Zollman, Martin Walter	SLA; KST

List of Purchase Contracts Made By Bureau of Aircraft Production

The following is a list of purchases contracted for by the Bureau of Aircraft Production:

[NOTE.—The first number at the beginning of each paragraph is the ORDER NUMBER, the second the CONTRACT NUMBER.]

August 12, 1918

30011–A–1. 1867–D. Wright-Martin Aircraft Corporation, New Brunswick, N. J., 2,000 Hispano Suiza 300-horsepower engines.

380627. 4455. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., plain hexagon head bolts with castellated nuts.

380662. 4457. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., machine bolts and castellated nuts.

380678. 4470. Armstrong Bros. Tool Co., Chicago, Ill., 2,400 structural wrenches, 100 C clamps.

710125. 4464. Hoosier Veneer Co., Indianapolis, Ind., 17,000 feet walnut lumber.

710126. 4462. Pickrel Walnut & Veneer Co., St. Louis, Mo., 40,000 feet walnut lumber.

710127. 4476. George W. Hartzell, Piqua, Ohio, 95,000 feet walnut lumber.

710128. 4479. Des Moines Sawmill Co., Des Moines, Iowa, 500,000 feet walnut lumber.

720137. 4460. Howell & Lesser, San Francisco, Cal., spares for 75 JN4D planes, elevators, landing gears, rudders, wings, etc.

720245. 4471. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., sets dual controls for 436 JN6H advanced training planes.

720269. 4450. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., 91 sets dual controls for JN4D planes.

720274. 4461. F. A. Requarth Co., Dayton, Ohio, 75 gear training models.

720276. 4463. United States Aircraft Corporation, Redwood City, Cal., spares for 50 JN4D planes, elevators, vertical fins or stabilizers, landing gears, rudders, wings, etc.

720278. 4463. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., 26 sets upper wings, with ailerons.

730155. 4433. General Motors Corporation, Flint, Mich., 5,000 Liberty right cylinder motors.

730187. 4469. Packard Motor Car Co., Detroit, Mich., 100 Liberty 12-cylinder aviation engines.

810017. 4465. Norwich Chemical Co., Smethport, Pa., 4,500 gallons acetone.

810018. 4466. W. S. Gray & Co., New York City, 5,000 gallons methyl ethyl ketone.

810019. 4467. American Cyanamid Co., New York City, 2,350 pounds urea in containers.

July 31, 1918

380553. 4405. Taft Pierce Manufacturing Co., Woonsocket, R. I., equipment for motor assembly plant.

720171. 4408. Jas. Cunningham & Sons Co., Rochester, N. Y., 50 Burton type balloon windlasses.

740062. 4407. The Russ Co., Cleveland, Ohio, 9,500 carrying chests.

870048. 4404. Eastman Kodak Co., Rochester, N. Y., license to the Government under patent No. 733,729 and reissue No. 12,637 for dopes, to make or have made and use the processes and products covered by the above mentioned patents for war purposes and during the period of the war.

August 1, 1918

450013. 4411. North Carolina Pine Emergency Bureau, Munsey Building, Washington, D. C., 5,600 pieces lumber.

720195. 4410. Canadian Aeroplanes (Ltd.), P. O. Box 638, Toronto, Ontario, Canada, spares for Canadian JN4-D planes, aileron fittings.

730142. 4409. Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spares for "V-2," type 3, engine (470 items).

August 2, 918

130036. 4412. George H. Maus, Amsterdam, N. Y., 60,000 bamboo poles.

720202. 4416. The Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., spare parts for 436 JN6-H-T training planes, equipped with forward gun and dual control; engine bed bearers, cowls, elevators, landing gears, rudders, wings, etc.

720205. 4417. Thomas Morse Aircraft Corp., Ithaca, N. Y., 150 gunnery aeroplanes, S4-C complete.

720208. 4418. Packard Piano Co., Fort Wayne, Ind., 1,000 combat propellers for US-12 engines.

720209. 4419. Hallet & Davis Piano Co., Boston, Mass., 1,000 combat propellers for US-12 engines.

Blackburn

AIRCRAFT

are made in ENGLAND and by their superior design and high efficiency have contributed to the Aerial supremacy of the Allies

Always at the Front

Made by
The Blackburn Aeroplane
and Motor Co., Ltd.
LEEDS & HULL
England
Steele's Adv. Service, Ltd.

ORDNANCE ENGINEERING CORPORATION

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Manufacturers of Illuminating Shells, Trench Howitzers, Hand Grenades, etc., etc.

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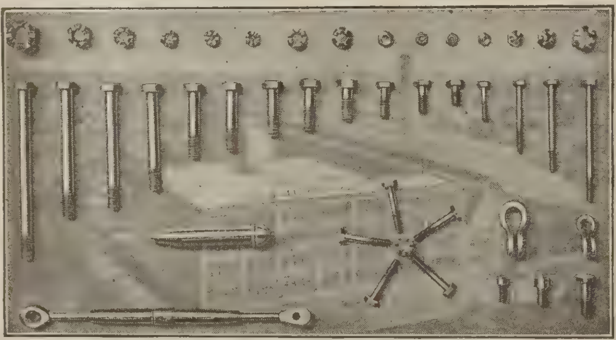
Designers and Builders of Military and Naval

AIRCRAFT

Lippincott Aircraft Parts



Small Metal Parts for Airplane Assembling

OUR PRODUCTIONS COMPLY FULLY WITH GOVERNMENT SPECIFICATIONS

Screw Machine Products
Lathe and Milling Machine Work
We Specialize in Machining Aluminum Castings
Quantity Production—Contract Work

Estimates and Shipping Dates Furnished upon Request
Exceptionally prompt deliveries of Standard Castellated Nuts

A. H. & F. H. LIPPINCOTT
24th and Locust Streets Philadelphia, U. S. A.

CONTINENTAL AEROPLANES

EMBODY

SPEED, STRENGTH, EASE OF CONTROL, WIDE RANGE OF VISION FOR OBSERVER, CAMERA MAN OR GUNNER IN ADDITION TO OTHER FEATURES OF EXCELLENCE

The Continental Aircraft Corp.

OFFICE
120 Liberty St.,
New York City

FACTORY
Amityville,
Long Island, N.Y.

MANUFACTURERS OF
Aeroplanes, Experimental Aeroplanes and Parts
Our machines are now being demonstrated at Central Park, L. I.

THE AVRO AEROPLANE is designed and built for easy control.

Pilots know that it responds to their intentions in all circumstances and in all weathers.

That is why it is the service training machine.

A. V. ROE & Co., Ltd.

Designers & Constructors of
Aeroplanes & Accessories

MANCHESTER, SOUTHAMPTON
and
166, PICCADILLY, LONDON, W.1

AVRO

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AERIAL AGE
WEEKLY

Vol. VII SEPTEMBER 9, 1918 No. 26

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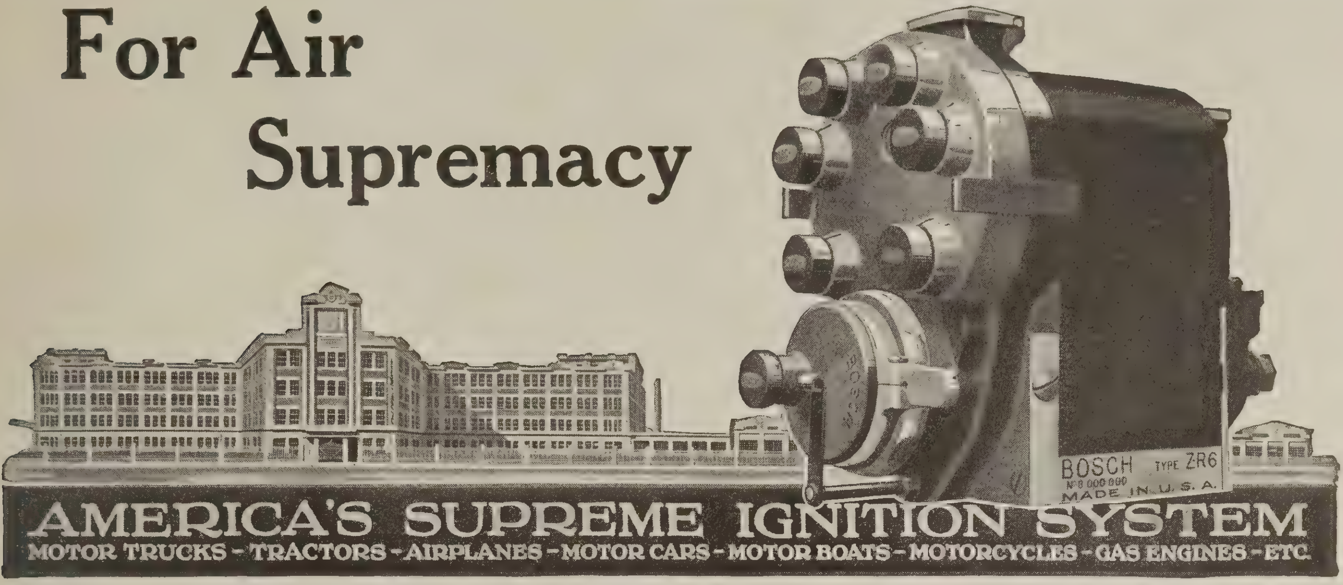
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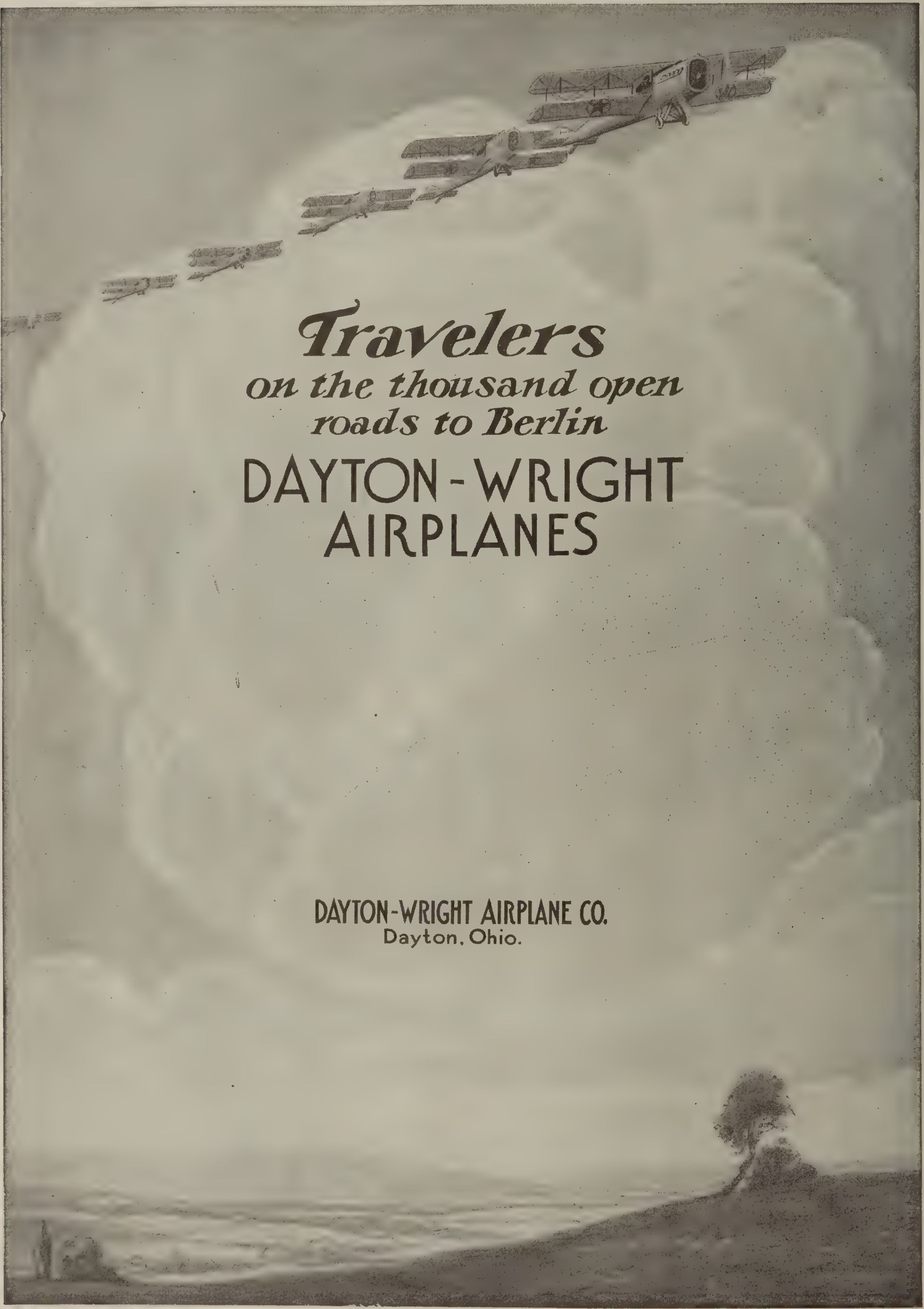

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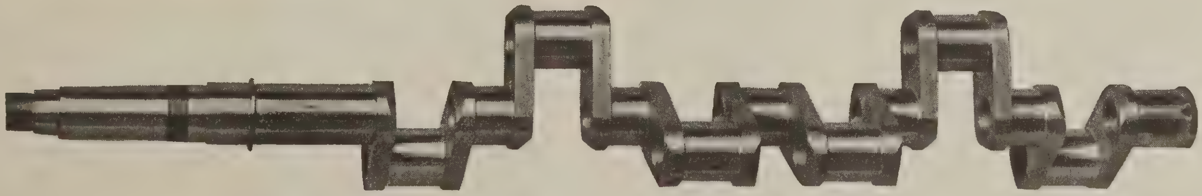

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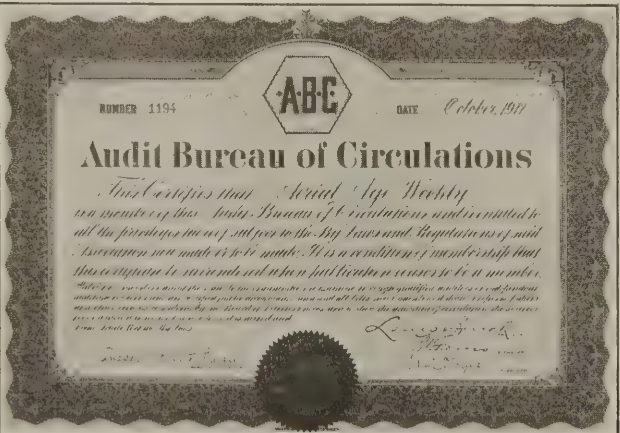

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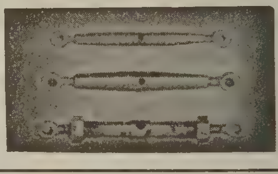

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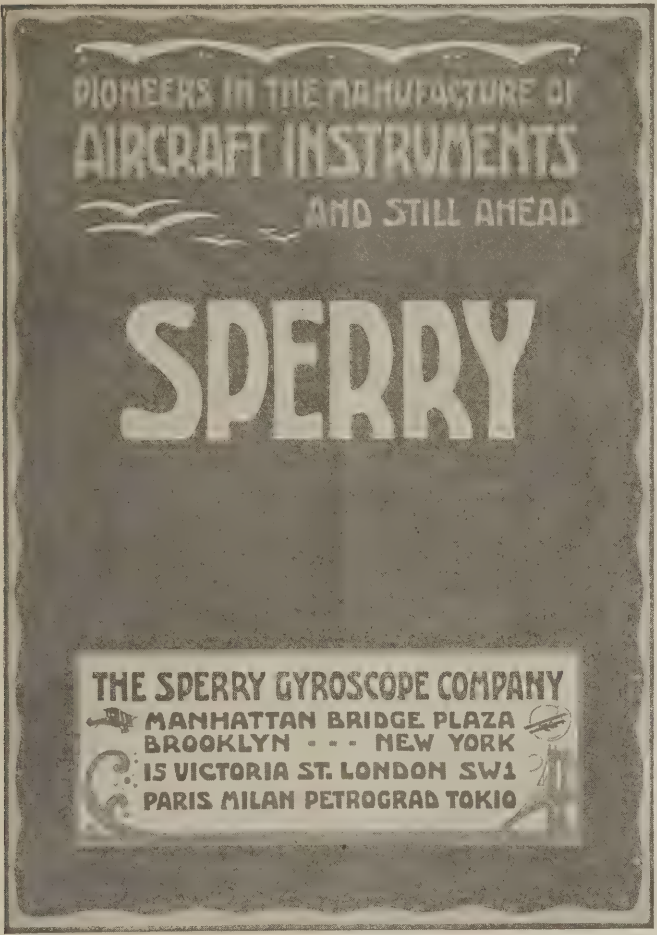

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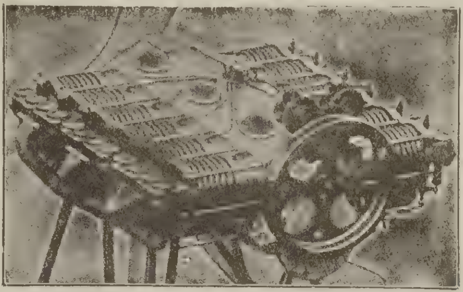

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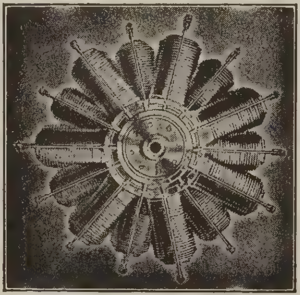

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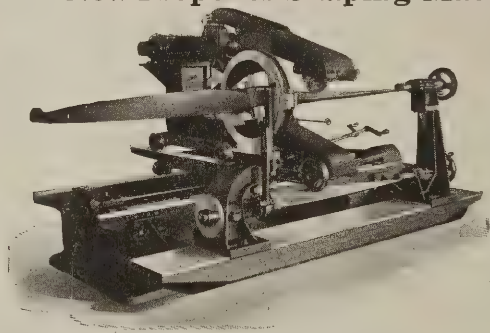

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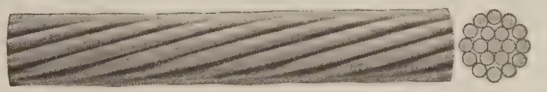

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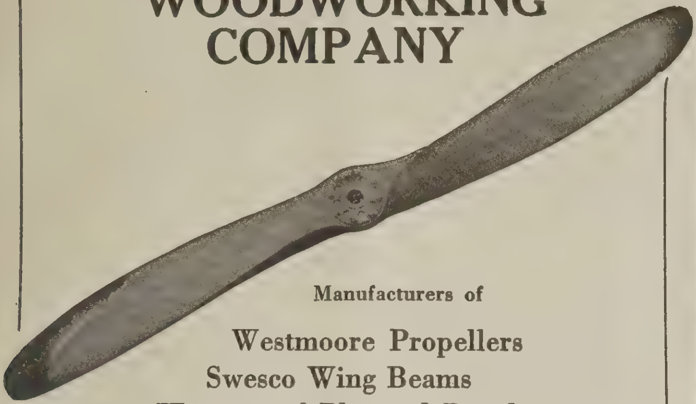

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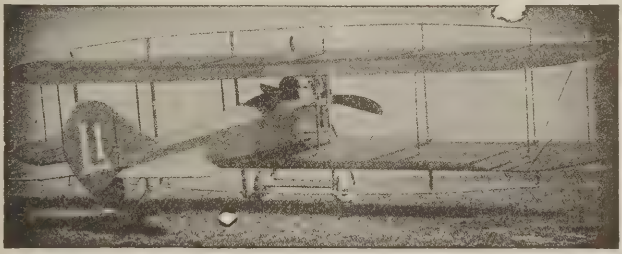

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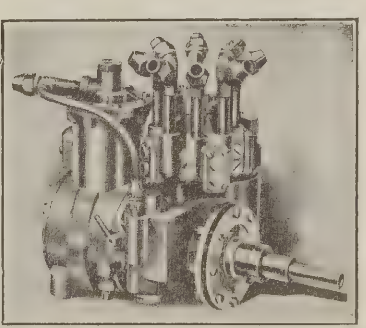

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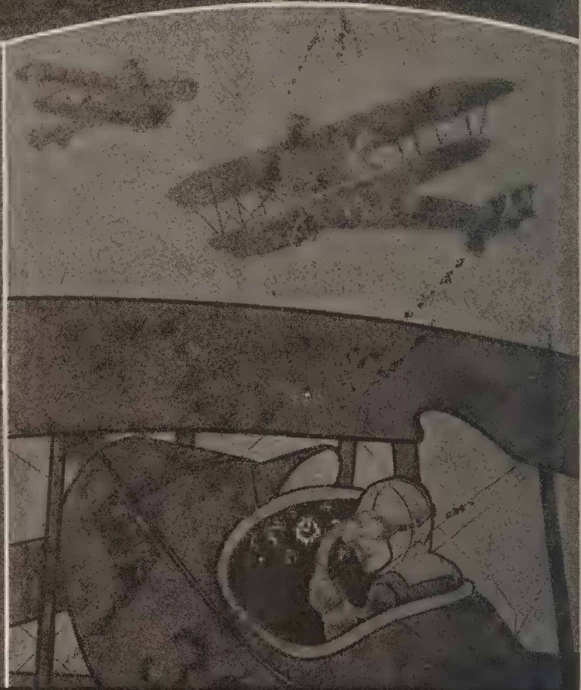

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